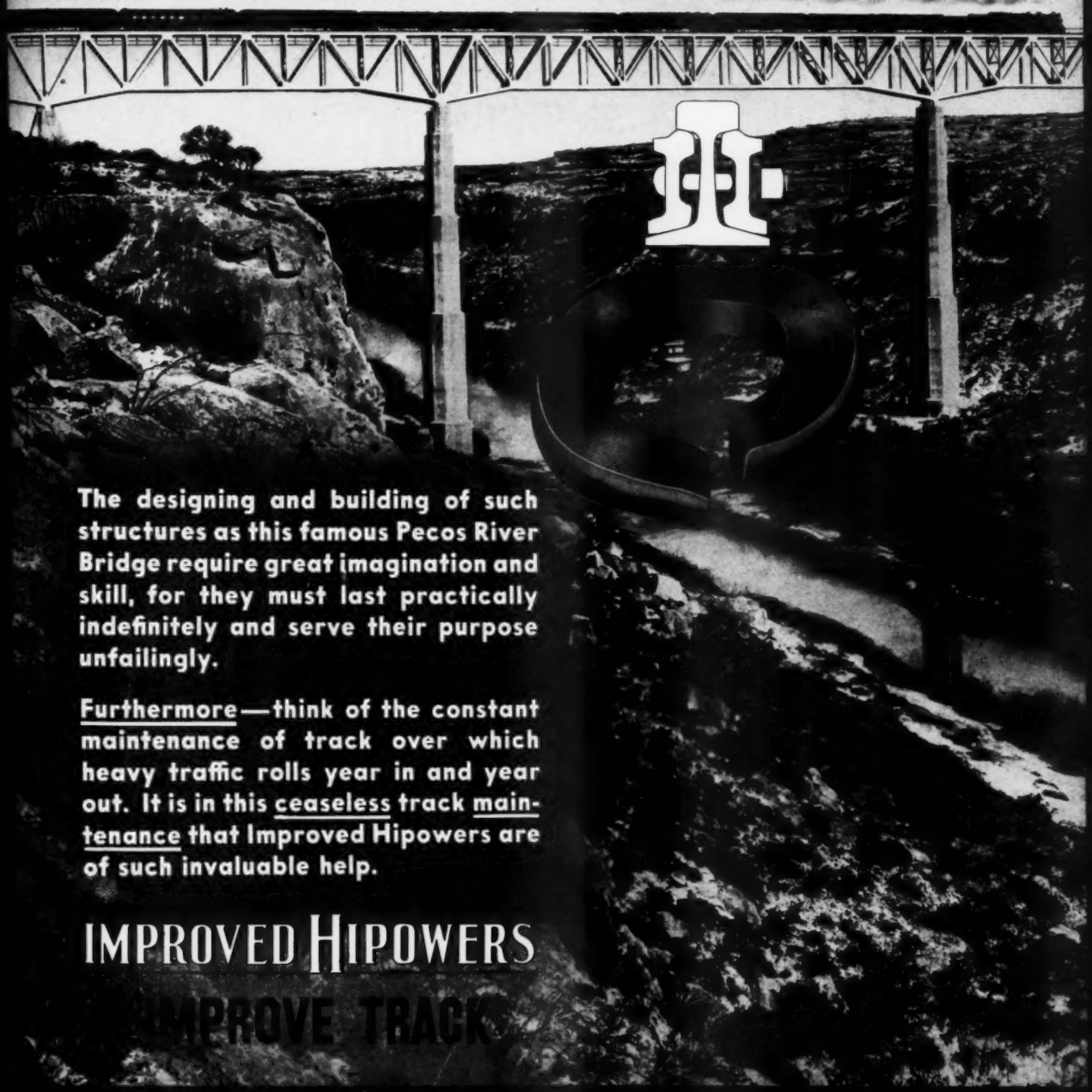
APRIL, 1948

Railway Engineering and Maintenance



The designing and building of such structures as this famous Pecos River Bridge require great imagination and skill, for they must last practically indefinitely and serve their purpose unfailingly.

Furthermore—think of the constant maintenance of track over which heavy traffic rolls year in and year out. It is in this ceaseless track maintenance that Improved Hipowers are of such invaluable help.

IMPROVED HIPOWERS
IMPROVE TRACK

NATIONAL LOCK WASHER COMPANY, NEWARK, N. J., U. S. A.
A COMPLETE LINE OF RAILWAY SPRING WASHERS

Supporting Maintenance

to save track . . .
to save dollars . . .

SUPPORTING maintenance is the best answer to the problem of keeping track standards high — maintenance costs low.

Supporting maintenance starts with little things — like keeping rail joint bolts tight. Reliance Hy-Crome Spring Washers for track applications can be counted on to do this job. Their long-range, non-fatiguing reactive pressure automatically reduces the rate of loss of track bolt tightness, keeping rail joint bolts **tighter longer.**

Reliance Hy-Crome Spring Washers are manufactured from special-analysis alloy steel developed by Reliance Research Engineers in cooperation with practical railroad maintenance men and cold drawn in Reliance's own mill to insure uniform quality and high standards.

There is a Reliance Hy-Crome Spring Washer for every track application.

Reliance Hy-Reaction Hy-Crome Spring Washers are fabricated to Pennsylvania Railroad specifications

Reliance Hy-Pressure Hy-Crome Spring Washers meet old A.R.E.A. specifications.

Reliance Xtra-hy Hy-Crome Spring Washers are made for the proposed new A.R.E.A. specifications.

Reliance Hy-Crome Pressure Springs meet Southern Pacific specifications.

"Edgemark of Quality"

Reliance HY-PRESSURE HY-CROME spring washers

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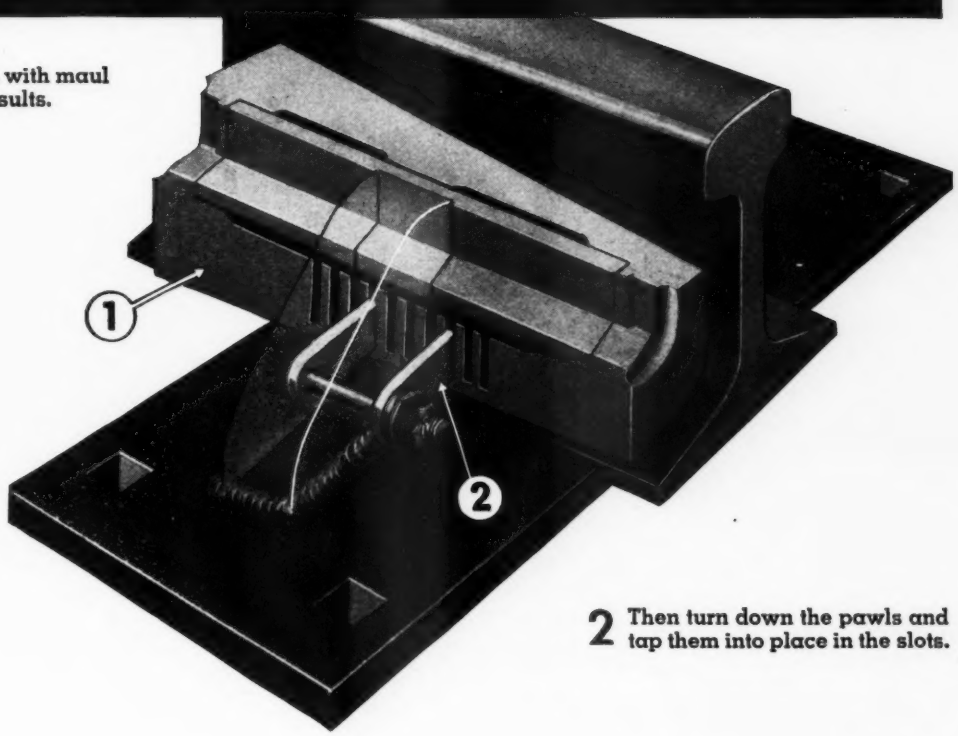
EATON
EATON MANUFACTURING COMPANY

NO LOOSENING...NO "CREEP" with Bethlehem 811 Rail Brace

1 Drive the wedge in with maul till correct gage results.



2 Then turn down the pawls and tap them into place in the slots.

A double order of safety is part of each 811 Rail Brace you install. Here's a device that traffic cannot loosen—a brace that "stays put" under the heavy shocks of high-speed, main-line service.

The Bethlehem 811 has several unique features, but two in particular merit careful attention.

The first is the wedge that fits closely between the rail web, the rail base, and the heavy 1¾-in. brace. Few things produce as tight and snug a joint as the wedge principle. Here in the 811 we employ this principle and even improve upon it. An insert of spring steel, integral with the wedge and capable of withstanding a compression force of 20,000 lb both vertically and laterally, increases the tightening effect.

Point No. 2 is the system of slots into which heavy pawls fit to prevent any possible creeping of the wedge. With these pawls locked in position, the wedge can't possibly work out of place.

Result: one of the most foolproof rail braces ever devised. Like to know more? Our representative will be glad to explain all details.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

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BETHLEHEM STEEL

Published monthly by Simmons-Boardman Publishing Corporation, 105 W. Adams St., Chicago 3, Ill. Subscription price: United States and Possessions, and Canada, $2.00 for one year; $3.00 for two years. Single copies 50 cents. Entered as second-class matter January 20, 1933, at the post office at Chicago, Ill., under the act of March 3, 1879, with additional entry at Mount Morris, Ill., post office. Address communications to 105 W. Adams St., Chicago 3, Ill.

GIVE "SOFT TRACK" LASTING STABILITY

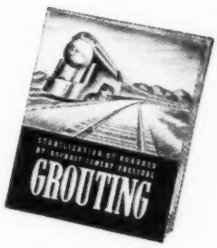
And make important savings in maintenance costs with the Texaco method of asphalt-cement pressure grouting.

MAINTENANCE man-hours per mile per year reduced nearly 50%! Maintenance cost per mile of double-track main line reduced 67%! These are two of many actual examples of how maintenance costs come down after stabilizing with the Texaco method of asphalt-cement pressure grouting.

The secret lies in preparing the grouting mixture with *Texaco No. 24 Emulsified Asphalt* – an asphalt especially developed for this purpose. Only small quantities of this superior asphalt are needed to promote easier flow of the grout, more thorough penetration and better seal.

Moreover, *Texaco No. 24 Emulsified Asphalt* waterproofs the soil and stabilizes it without loss of resiliency. This type of stabilization is the easiest and quickest to apply . . . lasts longer . . . and costs less.

For full details, ask for the book shown at the right. Just call the nearest Railway Sales Division office listed below, or write The Texas Company, *Railway Sales Division*, 135 East 42nd Street, New York 17, N. Y.



SEND FOR this fact-packed, 16-page, illustrated book. Describes the development of asphalt-cement pressure grouting, outlines a practical working set-up, shows costs, and benefits secured by a leading railroad.

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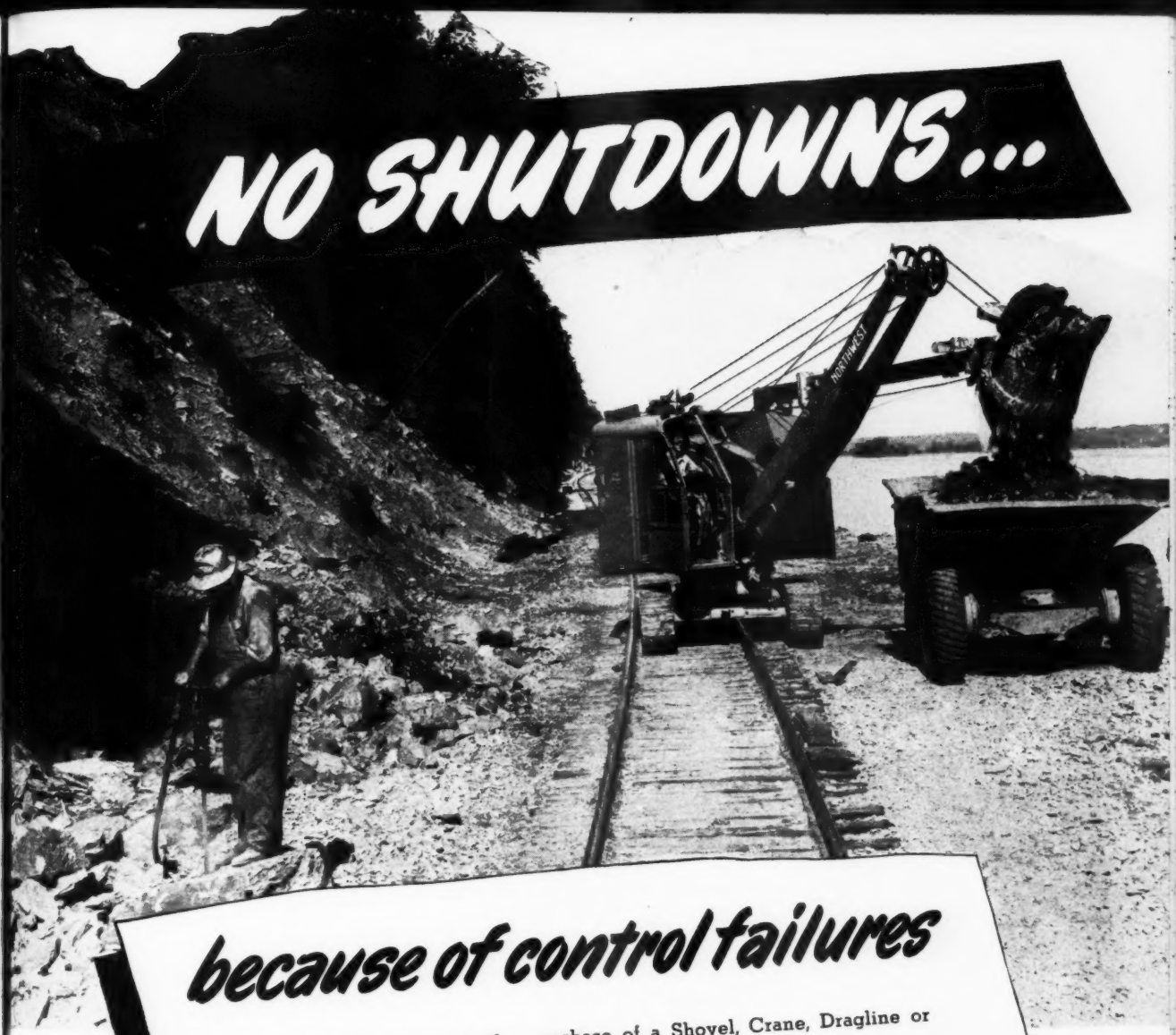

because of control failures

● When you plan the purchase of a Shovel, Crane, Dragline or Pullshovel, check into the subject of operation!

The "Feather-Touch" Clutch Control, the simple little device that makes Northwest operation *easy*, is practically fool-proof. It is a simple band device, free from high-pressure pumps and lines—nothing to refill, unaffected by weather and temperature and proved in years of service.

Release is positive and the *feel of the load* is in direct ratio to the movement of the control lever. This makes spotting easy, assures greater output and greater safety with the certainty that there will be no shutdown because of control failure.

This is only one of the many advantages of Northwest Crawler equipment. We'd like to tell you more about it. Plan ahead to have a Northwest in your division. Ask for details on the size machine you need.

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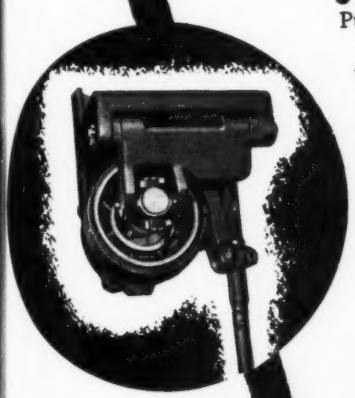
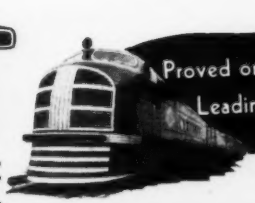
1513 Field Building · 135 South LaSalle St. · Chicago 3, Illinois



This is all there is to the "Feather-Touch" Clutch Control. It is a simple band device free from the complications that come with pumps and piping.

NORTHWEST

THE ALL PURPOSE RAILROAD MACHINE
SHOVEL • CRANE • DRAGLINE • PULLSHOVEL



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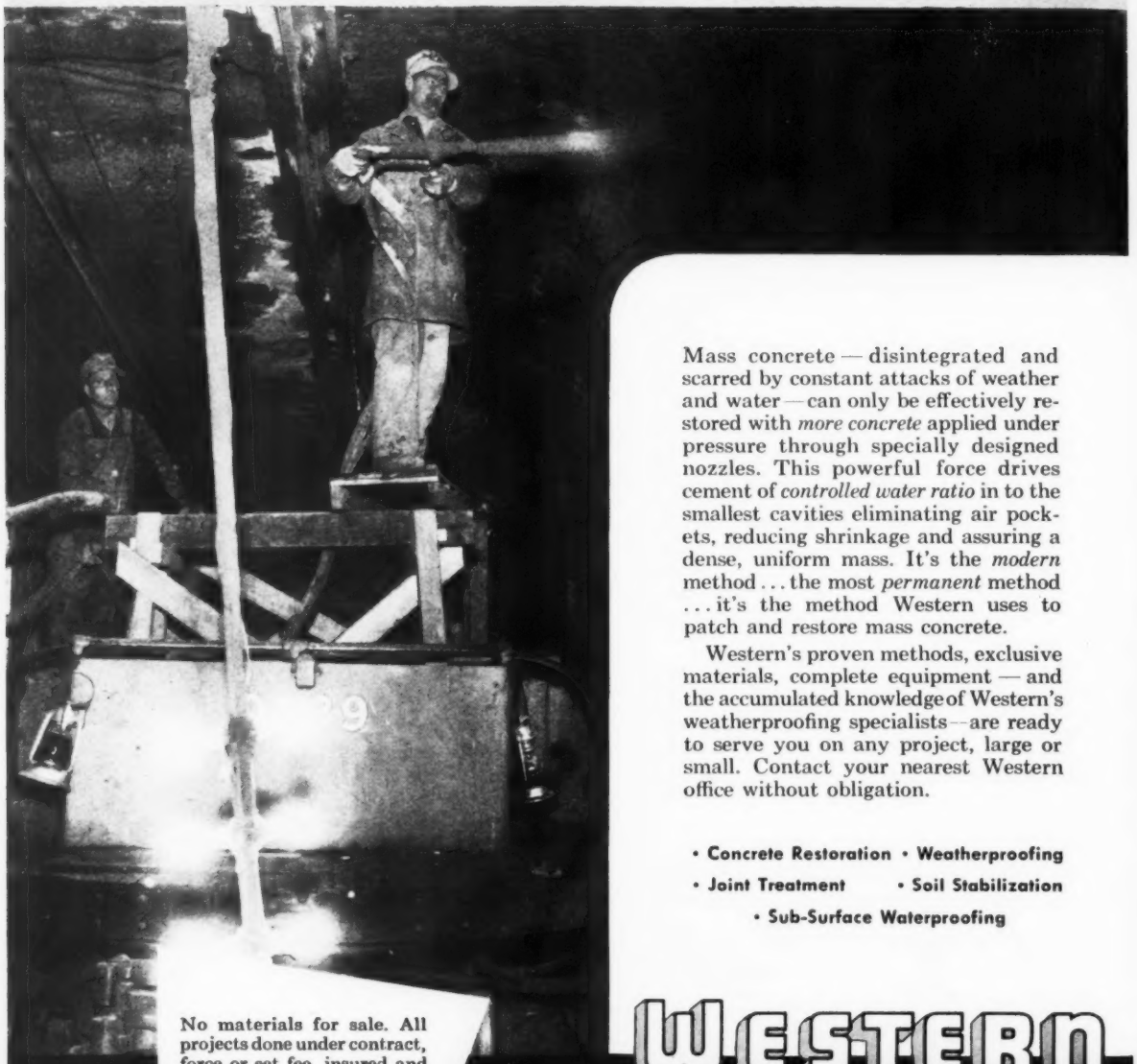
HOW *Weatherproofing* SERVES THE RAILROAD INDUSTRY

CEMENT.... GUN-APPLIED

RESTORES DISINTEGRATED CONCRETE



Mass concrete — disintegrated and scarred by constant attacks of weather and water — can only be effectively restored with *more concrete* applied under pressure through specially designed nozzles. This powerful force drives cement of *controlled water ratio* in to the smallest cavities eliminating air pockets, reducing shrinkage and assuring a dense, uniform mass. It's the *modern* method ... the most *permanent* method ... it's the method Western uses to patch and restore mass concrete.

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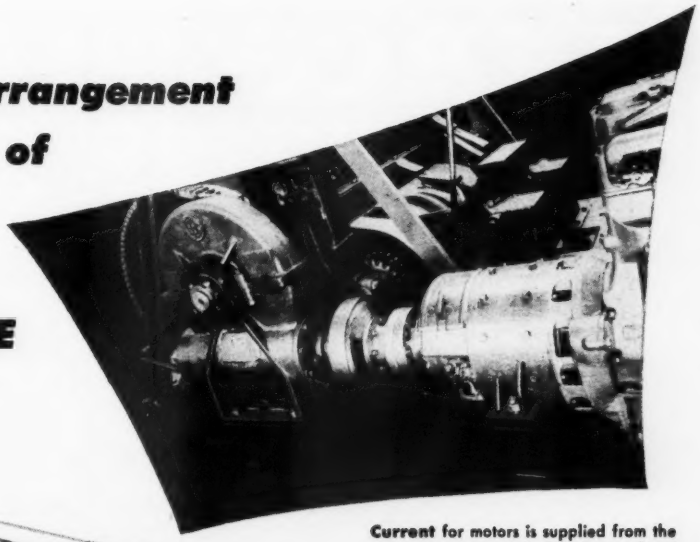
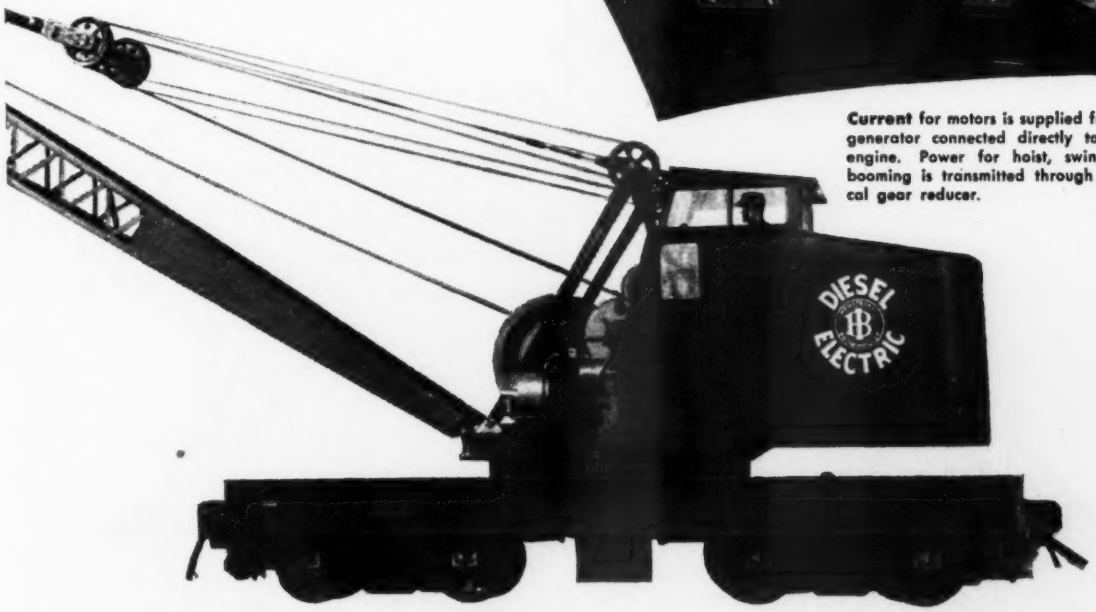
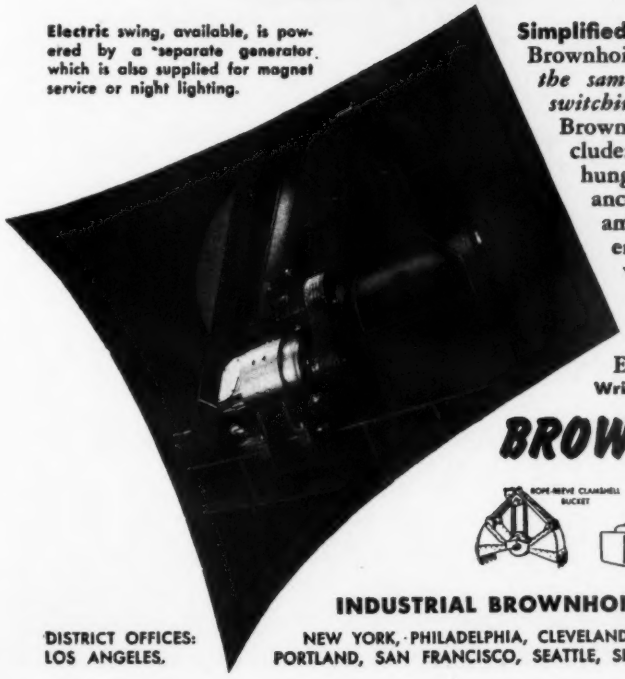
Simplified power arrangement increases efficiency of BROWNHOIST DIESEL ELECTRIC LOCOMOTIVE-CRANE



Current for motors is supplied from the generator connected directly to diesel engine. Power for hoist, swing, and booming is transmitted through a helical gear reducer.



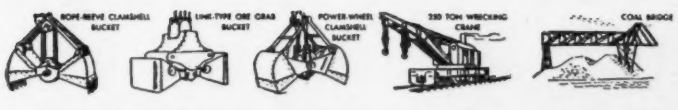
Electric swing, available, is powered by a separate generator which is also supplied for magnet service or night lighting.



Simplified design has increased efficiency in the new Brownhoist Diesel Electric Locomotive-Crane . . . and *at the same time reduced maintenance costs in heavy switching service.* Two examples of this advanced Brownhoist engineering are illustrated. Others include: A.A.R. cast steel side frame trucks with inside hung spring mounted travel motors with 4" clearance from top of rail; travel speeds up to 15 M.P.H.; ample power to permit double duty as a switch engine and heavy duty Locomotive-Crane; 360° visibility from Monitor-type cab; safe worm driven boom hoist; hoist and boom drums in full view of operator. You get *all these features and more with the new* Brownhoist Diesel Electric Locomotive-Crane.

Write for complete information.

BROWNHOIST BUILDS BETTER CRANES



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For Open Track

After seven years of intensive development we offer FABCO Tie Pads to reduce the mechanical wear of ties *on Open Track* . . . *and* at prices which make the first cost, as well as the last cost, a real economy to the railroads.

FABCO Tie Pads for Open Track are stocked for delivery in ¼" thickness in standard tie plate sizes 7¾" x 12"; 7¾" x 13"; 7¾" x 14"; with other sizes available on special order ... they withstand extremes of temperature, moisture, brine, mildew, and sand ... *and* their limited resiliency, without permanent set, means that spikes do not have to be driven down a second and third time. Many other advantages make it important that you GET ALL THE FACTS ABOUT FABCO TIE PADS — Today!

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For Open Track

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- Resilient—no set—no loose spikes
- Long Life—no renewals required

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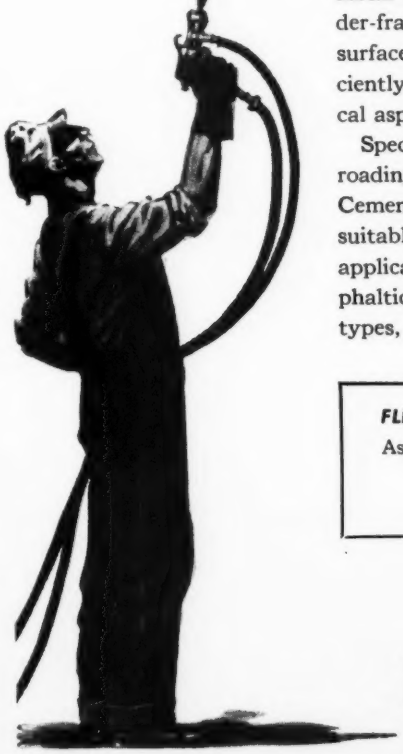
FOUNTAIN OF YOUTH FOR ROLLING STOCK



Flying gravel, seeping moisture and cinder-laden wind can make freight cars grow old fast.

Protect your rolling stock against these hazards with tough, quick-drying Flintkote Car Cements. Couplers, metal ends, slope sheets, trucks, under-frames . . . any vulnerable metal surfaces . . . can be quickly and efficiently protected with these economical asphalt-base compounds.

Specially formulated to meet railroading requirements, Flintkote Car Cements are available in consistencies suitable for spray, brush or trowel application. Or, you can specify asphaltic emulsions of a wide range of types, fibrated or non-fibrated. Flintkote Railroad Emulsions are "tops" in withstanding weather and severe exposures in the railway field.

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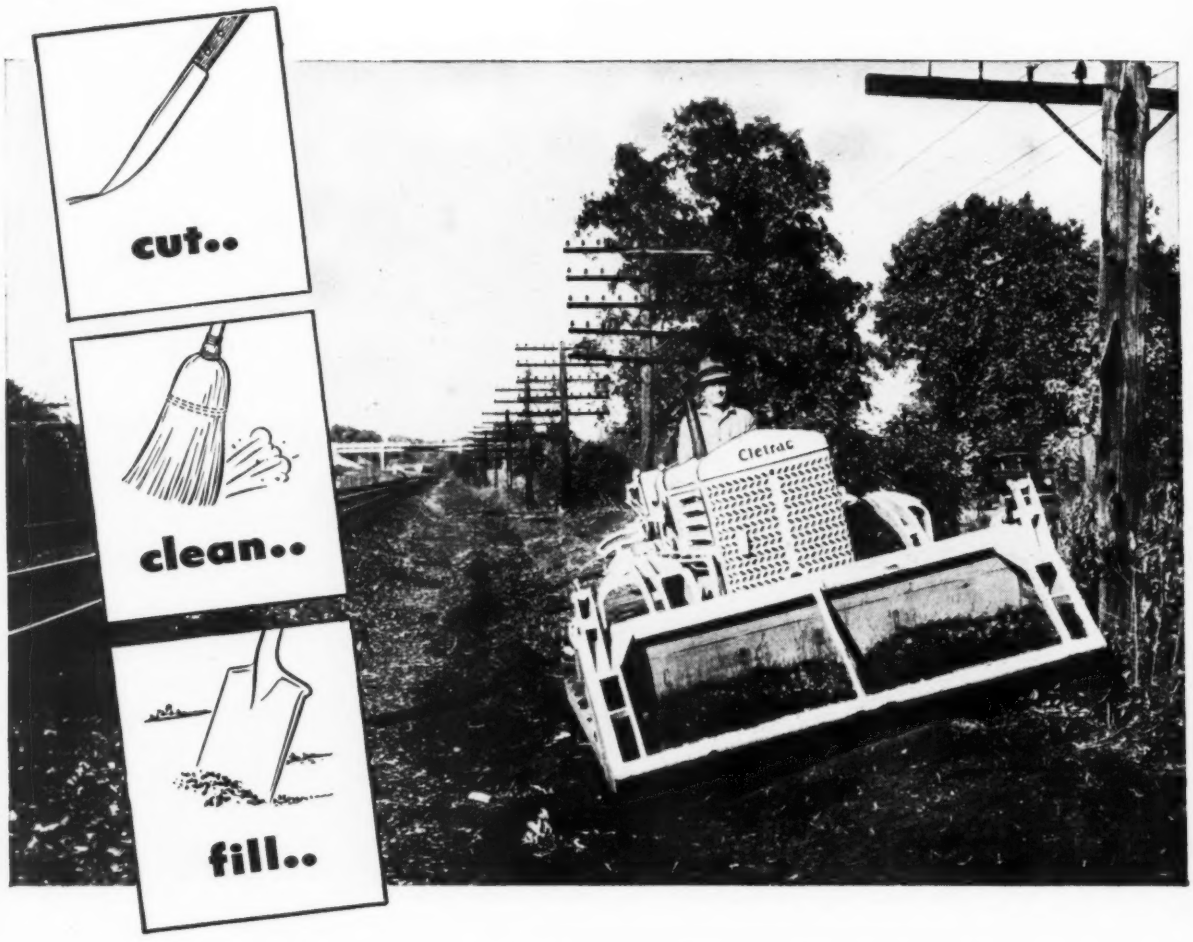
FLINTKOTE
Products for Industry



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Cutting and cleaning ditches . . . filling in low spots, one man can do the whole job with an Oliver "Cletrac" tractor and Drott Bull Clam.

This efficient unit cuts and removes grass and weeds, cuts ditches, levels and grades right-of-way, and carries surplus dirt wherever it's needed. It performs all the work of a scraper, shovel, grader and bulldozer . . . at far lower cost. Bowl is opened to make a cut . . . closed to carry the dirt without spillage. The bowl can be closed and down pressure applied to do fine-grading.

The exclusive Oliver "Cletrac" steering principle with power on both tracks at all times, permits the unit to work in closer quarters . . . to operate with greater safety on slopes and hills. It also allows the tractor to handle heavy front-end loads without excessive wear on tractor frames and steering mechanisms.

For all the facts on the "one-man crew" and the other versatile auxiliary equipment that makes Oliver "Cletrac" the most efficient off-track maintenance unit, see your Oliver "Cletrac" dealer or write The OLIVER Corporation, 19300 Euclid Avenue, Cleveland 17, Ohio.

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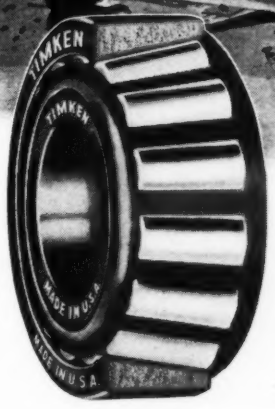

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The same generous measure of availability that characterizes main line rolling stock equipped with Timken Tapered Roller Bearings also is a major advantage of Timken Bearing Equipped section motor cars and trailers.

Besides their frictionless smoothness of operation in all weathers; extended lubrication periods; capacity for carrying radial, thrust and combined loads; and ability to maintain wheel gauge, Timken Roller Bearings possess the tremendous strength and endurance that comes from the special Timken Alloy Steel of which they alone are made. Make sure you have them in your new cars; look for the trade-mark "TIMKEN" on the bearings you use. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address "TIMROSCO".

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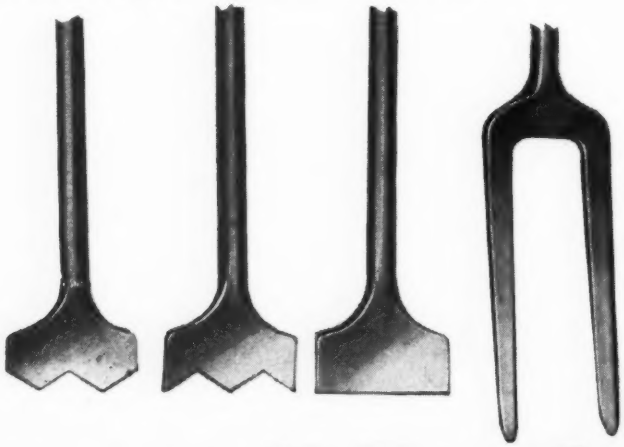

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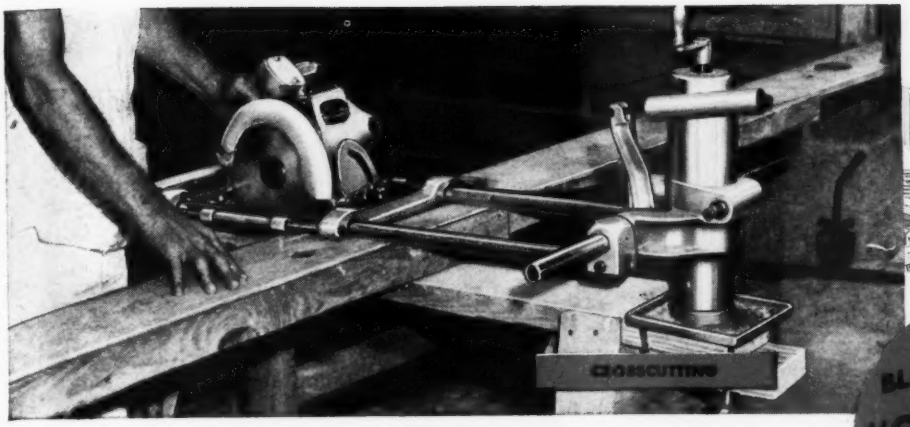


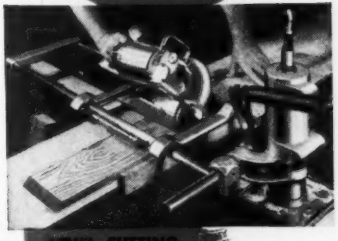
BLACK & DECKER "Quick-Saw" ARM $14.95 (NOT INCLUDING SAW)

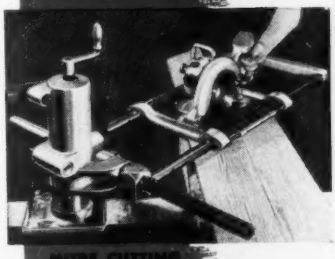
BLACK & DECKER NEW "Quick-Saw"* ARM

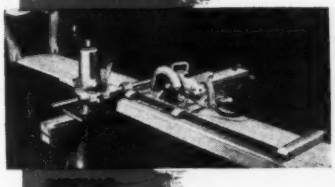
Multiplies the Usefulness of *Time and Labor* Saving Electric Saws!

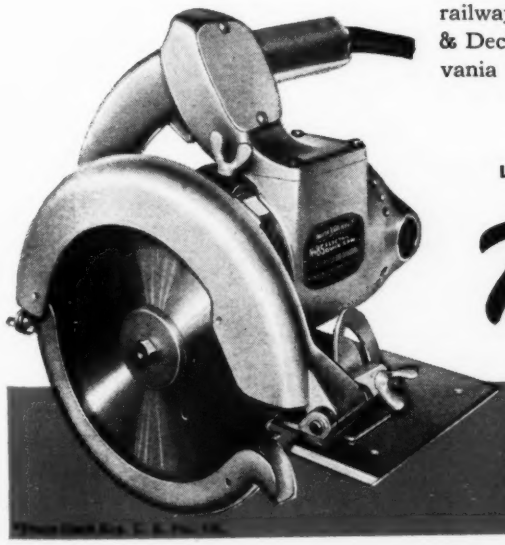
Now—add Radial Saw features to your Portable Electric Saws—with a Black & Decker Quick-Saw Arm! The new Quick-Saw Arm gives you *dual* versatility: (1) A *positive* set-up for continuous cutting; (2) *Flexibility* of adjustment to make many kinds of cuts. It helps you make more accurate cuts, increase speed, reduce fatigue.

All three Black & Decker Electric Quick-Saws (and most other portable electric saws) fit into the adjustable carriage of the Quick-Saw Arm in a jiffy. Entire unit clamps to saw horse or mounts on table. All adjustments quickly regulated on the column. And, however you use them, Black & Decker Quick-Saws beat hand sawing 10 to 1—in wood, metal, stone or composition sawing—with maximum safety. Ask your nearby Black & Decker Distributor for complete details. Write today for free catalog of many Portable Electric Tools for railway maintenance to: The Black & Decker Mfg. Co., 663 Pennsylvania Ave., Towson 4, Maryland.


LEVEL CUTTING


MITRE CUTTING





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Cuts up to 2-5/8" depth	Cuts up to 2-3/8" depth	Cuts up to 3-1/8" depth
$135.00	$115.00	$150.00

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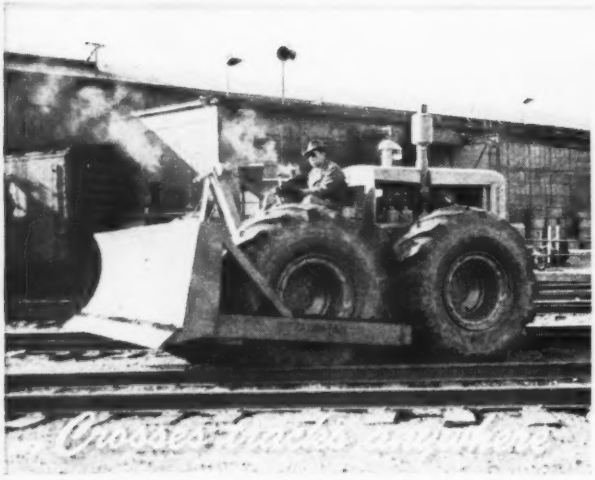

This new high-speed, rubber-tired Tournadozer is ideal for all types of railroad maintenance because it is powerful, fast and its soft low-pressure rubber tires can cross and recross tracks swiftly without planking . . . without damage to either ties or rails.

Completes rush washout repairs fast. Giant rubber tires provide plenty of traction and flotation in soft going, yet give smooth operation on any solid surface, enable Tournadozer to travel job-to-job at 15 m.p.h. . . . over pavement, black-top or cross country.

Instantaneous speed selection, constant-mesh transmission and four speeds, forward or reverse, enable you to stockpile coal, sand, gravel, cinders, etc., faster, more economically. ***Tournadozer travels 200 feet in time it takes a crawler to shift gears.***

Whether it's removing slides, filling washouts, spreading ballast, straightening tracks, "daylighting" curves or cleaning ditches, Tournadozer gets there faster . . . completes job more quickly and is off to the next. Saves time . . . fewer dozer units required.

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See your LeTourneau Railroad Distributor NOW for complete information

until you've seen the track TOURNADOZER

THE revolutionary high-speed, rubber-tired Tournadozer is the ideal off-track tool for the numberless rush jobs that have to be done along the right-of-way . . . Tournadozer travels twice as fast as crawler-tractors forward . . . three times as fast in reverse . . . dozes up to 30% faster with a full load . . . completes dozing cycles in a third of the time it would take a slow-moving crawler. No delay in shifting gears with Tournamatic constant-mesh transmission. Quick on-the-job or job-to-job moves . . . no hauling equipment needed . . . travels on pavement, black-top or cross country. Gets more jobs completed at lower cost per job. Wait till you see this Tournadozer in operation before buying any ordinary dozer!

Tournadozer, Tournamatic—Trademark R112-RR

Model C

- **Speeds up to 15 m.p.h., forward and REVERSE**
  4-speed selections from 1.91 m.p.h.
- **Non-stop, instantaneous speed selection**
  Constant-mesh Tournamatic transmission.
- **Easy to operate . . . air actuated controls**
  Finger-tip steering and blade operation . . . single pedal for brakes.
- **Tapered bead tires . . . 21.00x25**
  Permit lower pressure for operation in sand or muck.
- **Big load capacity . . . 11' 2"x43" blade**
  Lift 44", drop, unlimited; cable control; fast-acting.
- **180 h.p. Diesel . . . weight 15 ½ tons.**

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PREVENT CORROSION, RUST AND DISINTEGRATION

9 good reasons

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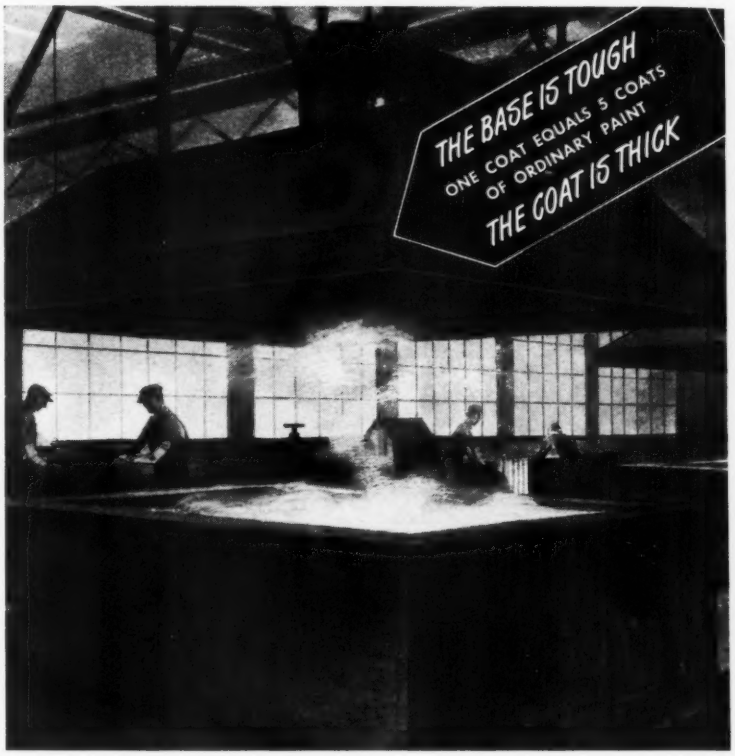

1. Its thick, tough protective film is waterproof and resistant to

- **A** Sunlight
- **B** Alkali or acid fumes
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2. Each coat is 5 times as thick as paint, and that means longer life.

3. It is easily applied by brush or spray.

4. It can be applied to old paint coats if they are well bonded.

5. It is quick drying.

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7. It does not alligator or check in intense sunlight.

8. It resists heat and cold—from minus 50° F. to 500° F.

9. It contains no volatile organic solvents; this eliminates danger of fire or explosion when it is applied in confined spaces.

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Eight other Koppers Protective Coatings with tough bases are available for special corrosive conditions.

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(1) Coal-tar pitch roofing
(2) Bitumastic Protective Coatings for pipe, structural steel
and other metal, concrete, masonry and insulation. (3) Plastipitch Protected Metal for roofing and siding of industrial and farm buildings
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wheel burns built-up FASTER...AT LESS COST this time-proved way

Today, wheel or engine burned rails are built-up AT LOW COST with this modern Airco oxyacetylene technique.

Fast . . . easy . . . the defective metal is first removed by flame gouging using a welding torch or an Airco Style 9000 Cutting Torch and Style 185 No. 10 gouging tip. Then, the gouged area is quickly built up to correct surface level with the fast-flowing Airco Railroad Rod. Thousands of successful welds prove the effectiveness of this procedure.

An interesting, illustrated booklet which tells in detail the many time- and cost-saving applications of modern welding and cutting methods in maintenance-of-way operations is available. *To obtain your free copy of "Efficient Maintenance-of-Way Operation with the Oxyacetylene Flame and Arc Welding" write to Dept. REM-6985,* Air Reduction, 60 East 42nd St., New York 17, N. Y. In Texas: Magnolia Airco Gas Products Company, Houston 1, Texas.

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Interchangeable attachments for shovel include ¾ and 1 cu. yd. material handling bucket, bucket teeth, bulldozer blade, 2 cu. yd. snow loader bucket and V-type snow plow.

A 2-wheel scraper may also be used with this outfit. Scraper can be operated with shovel hydraulic system or its own hydraulic system.

Use this versatile combination for right-of-way construction and maintenance, handling ballast, snow-removal, backfilling, laying and moving tracks, clearing wrecks, all kinds of hauling.

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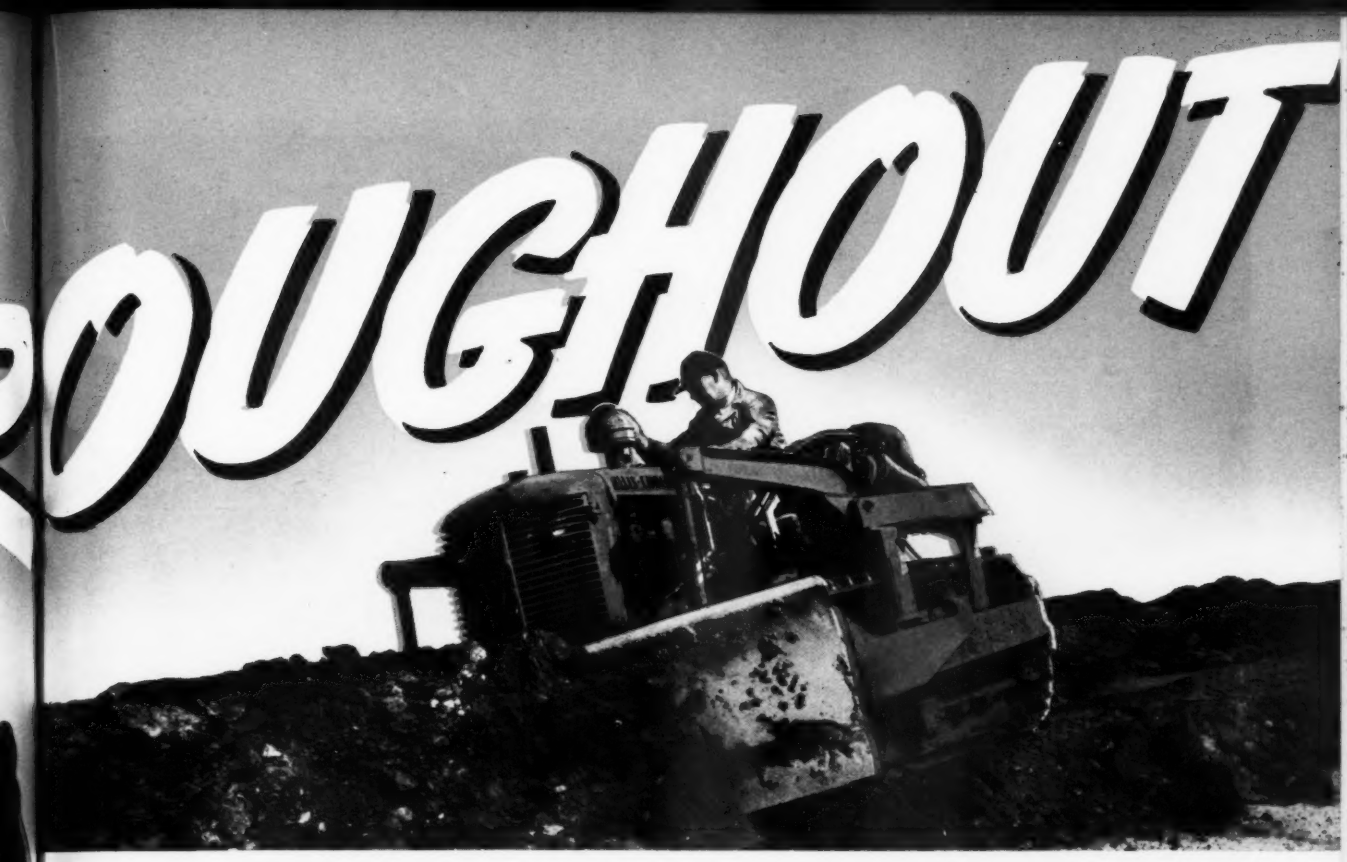
2-cycle GM Diesel Power



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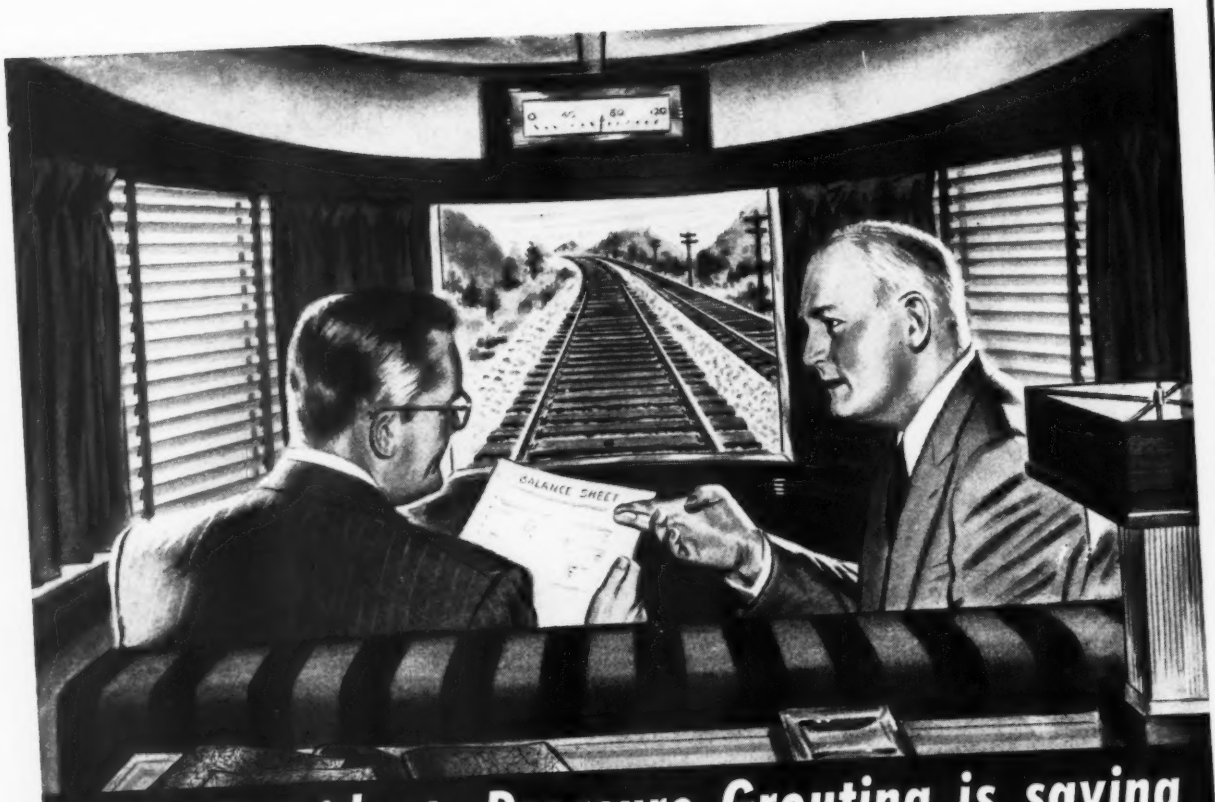

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Investment	**Saved maintenance**—30%-90%
Equipment—Small	**Return on original investment**—
Labor—Regular Section Forces	As high as 900% in one year
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	Longer rail life
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	Men released for more productive work
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Reversible Impact Wrench, with pistol grip—CP 365-RP—saves hours in running nuts, and in applying or removing bolts, studs and lag screws.

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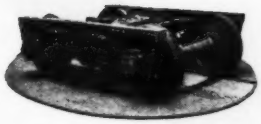

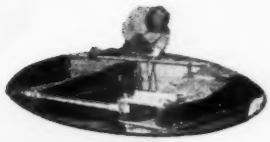

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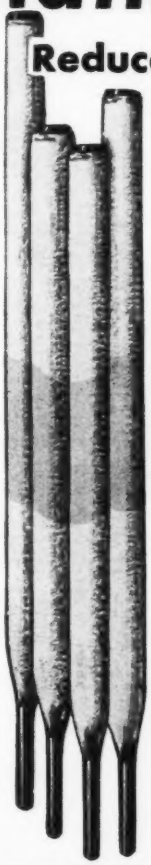
Reduce Your Fabricating and Repair Costs

...use efficient P&H electrodes for fast deposition, sound welds, and easy manipulation



There's a time-saving P&H electrode for every welding problem — Steel sheet, some bar stock and channels provide a quick, easy method of giving your old cars the "new look." For work of this kind we recommend two electrodes — the Class E-6010 "AP" rod and the Class E-6012 "PF" rod. These two electrodes can do 90% of all your welding:

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For *building up and hard surfacing worn parts,* your best bet is one of the new P&H Hartop electrodes.

Nicast, thanks to its proper coefficient of expansion, is ideal for making machinable repair welds in cast iron, or for joining cast iron to steel.

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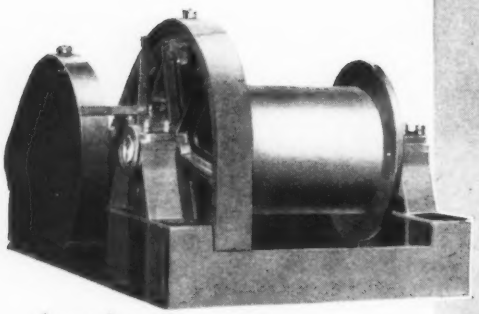

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Made in two sizes, individually engineered to fit the job. Quotations and plans gladly furnished on receipt of information concerning the installation.

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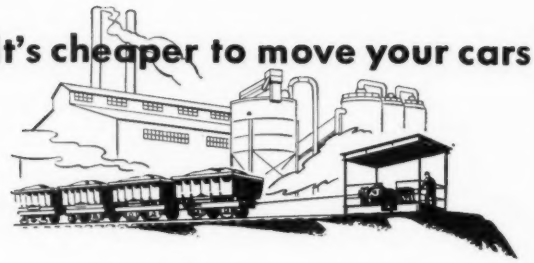

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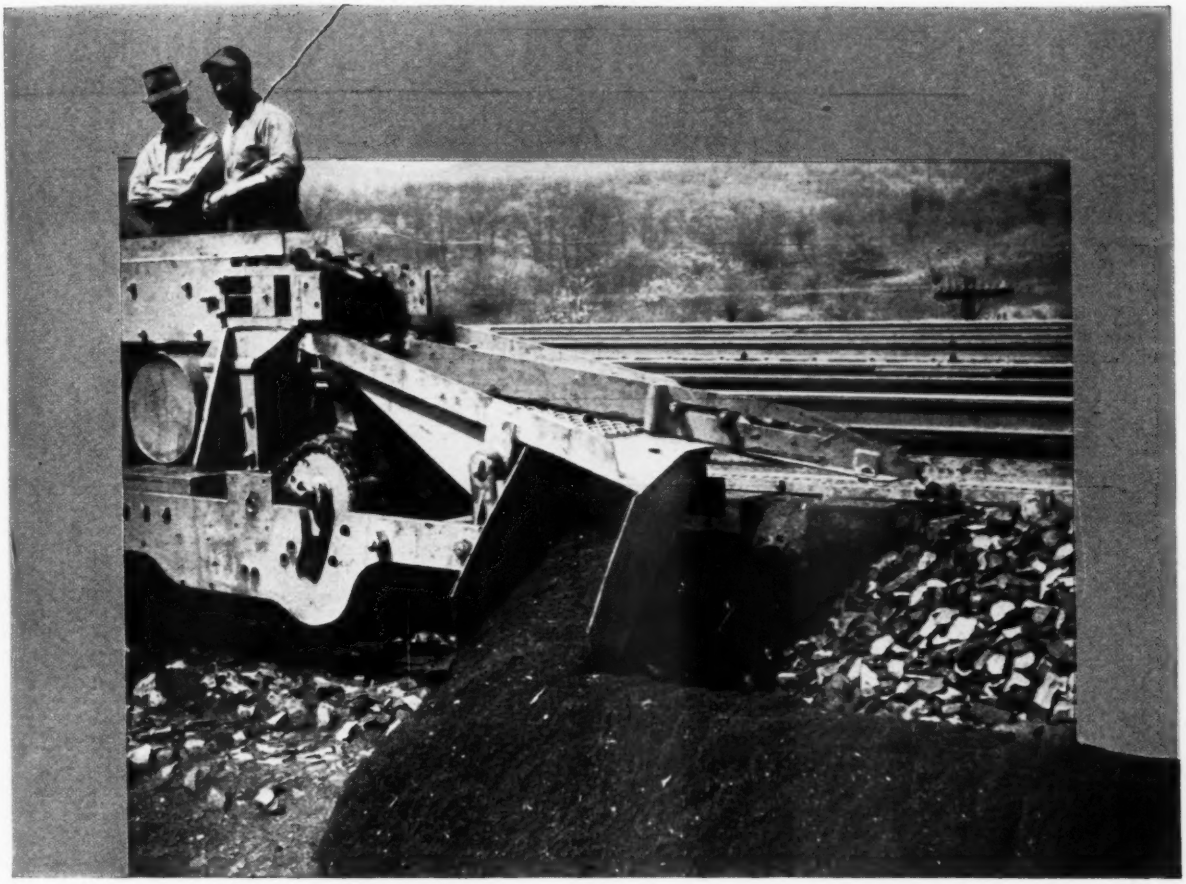

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"OFF THE TRACK" EQUIPMENT
Expedites, Simplifies, Reduces Costs on Maintenance and Construction

The term "off-the-track" makes clear the principal advantage of the crawler type shovel-crane for railway construction and maintenance. The Link-Belt Speeder machines illustrated are all working freely and entirely independent of the rail traffic. It is also obvious, that a crawler or wheel mounted unit can operate at any distance from the rails, as in the

Grading and cutting ditch along right-of-way.

After levelling the road bed with dragline, the Link-Belt Speeder is placing ties and laying rails.

case of a power shovel digging and loading ballast in a quarry, or excavating or building beyond the rails. The machine can be maneuvered into its most advantageous operating position, when it is off the rails.

The Link-Belt Speeder line of Shovel-Cranes ranges in capacity from the ⅜ cubic yard up to the 3 cubic yard size, and each machine can be readily converted to use as shovel, crane, dragline, clamshell, pile driver or trench-hoe. Earth moving operations such as grading or ditching are commonly performed using the dragline bucket, which is also useful in handling sand and gravel in stock piles. The dragline gives the unit its widest area of operation, the power shovel works in a more limited area, but supplies greater digging power, as required in rock cuts, for example. The same boom will permit the use of clamshell or dragline, or hook-block or slings for handling rails, structural steel or other types of material in loading, unloading or construction work.

Half yard dragline replacing fill after construction of bridge.

Building levee on river bank to protect railway right-of-way against flood damage.

There is a Link-Belt Speeder distributor near you, equipped and trained to supply quick, courteous, efficient sales or service on all types of Link-Belt Speeder Machines. Call on him for detailed explanation or demonstration of the broad line of Link-Belt Speeder Shovel-Cranes.

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Builders of the Most Complete Line of
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Every Railroad's Greatest Asset
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GUARDED FOR MORE THAN 100 RAILROADS BY SPERRY'S FLEET OF 20 DETECTOR CARS

During 1947, Sperry Detector Cars found approximately 47,000 rails containing Transverse Defects —equivalent to 28.5 TD's per 100 track miles tested and an increase of almost three TD's per 100 miles over the 1946 figures.

Also during 1947, approximately 36,000 Longitudinal Defects (Vertical and Horizontal Split Heads) were found, making 1947 the sixth consecutive year in which more than 35,000 Longitudinal Defects have been detected.

The annual results again confirm the superiority of *Sperry-operated* Detector Cars which find:

1) MORE TRANSVERSE DEFECTS — and of smaller size — than any other method of testing rails in track, and
2) MORE LONGITUDINAL DEFECTS — than any other method of testing rails in track.

Higher train speeds and greater axle loads have increased the need for effective rail testing. Today as always, Sperry stands ready to make comparative demonstration tests to prove superior performance.

SP-124

Here a few detected rail failures containing Transverse Defects have been broken for analysis. Seventy-two (72%) of the Transverse Defects found in 1947 were small in size—a good indication of Sperry efficiency.

Safety with Sperry

for

Testing Rails in Track

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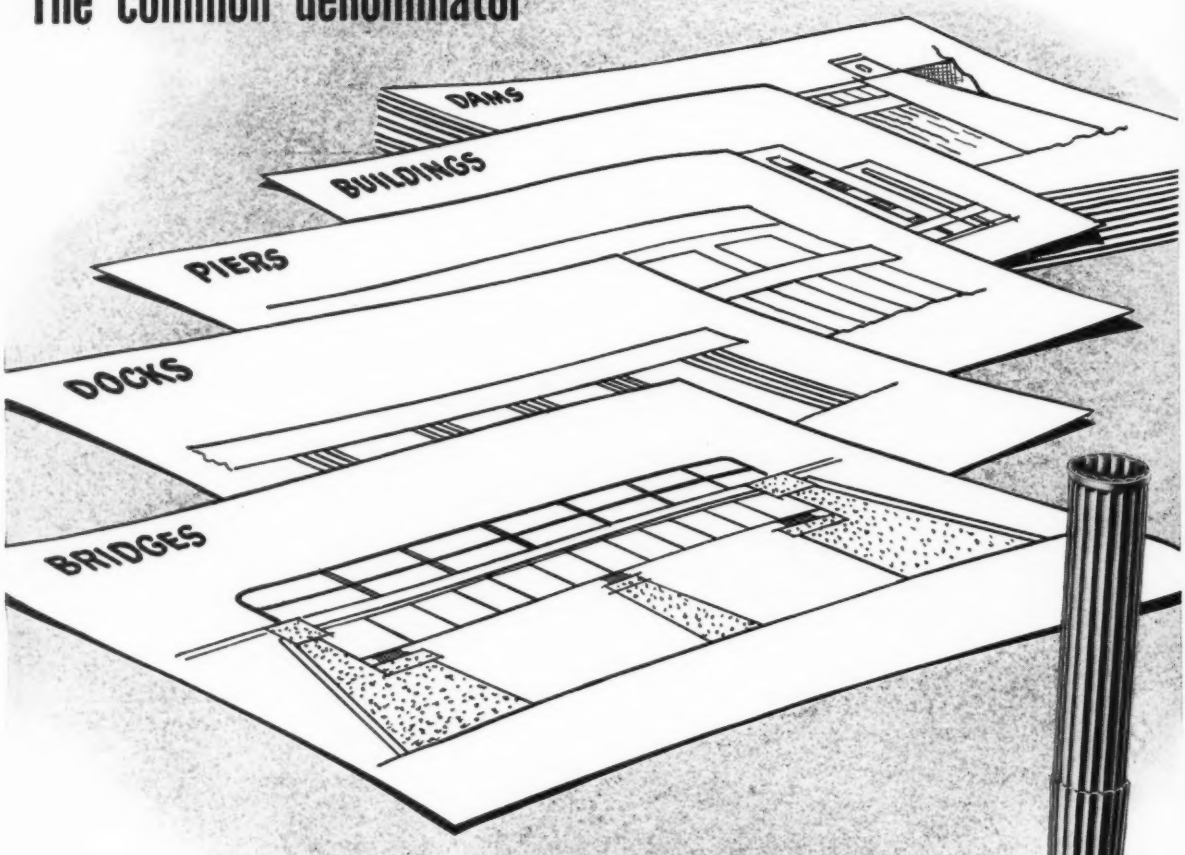
The common denominator



for the best laid plans... MONOTUBE FOUNDATIONS

MANY of tomorrow's most ambitious projects are being planned *right*—will be started *right*—with Monotube tapered steel piles.

They are chosen by experienced architects and builders because they've proved on one job after another that they reduce foundation costs—save valuable time.

Here's a typical experience from a bridge builder: "The Monotube piles were driven by use of a timber grillage for holding the piles in position. The light, rigid piles were easily handled and held their alignment even though hard driving was encountered."

And here are more advantages: *Monotubes' fluted, tapered design speeds driving; they are easily extendible, right on the job; their tubular construction makes inspection, before concreting, quick and easy.*

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UNION METAL

Monotube Foundation Piles

Ice loading dock at Harlingen, Texas handles 78 CARS at a time

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KOPPERS PRESSURE-CREOSOTED WOOD

puts SOME MAINTENANCE SAVINGS *On ice!*

Everyone concerned with icing operations knows the punishment that the docks must take, wear . . . abrasion . . . and intermittent exposure to moisture that sets up ideal incubators for decay.

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During the average year, railroads use about 13 million tons of ice in "reefers." Almost every railroad has some share in the problem . . . and some stake in the maintenance of icing docks. In new construction, or in repair work, Koppers Pressure-treated wood can help to put added durability and added economy into the structure.

Koppers operates 21 treating plants, strategically located for prompt, convenient, efficient service to the nation's railroads. Large yards provide ample space for storage and seasoning . . . treating is done in modern equipment, by experienced personnel . . . and half a century of service to the railroads has made us completely familiar with your methods and requirements. Let us quote on your next order.

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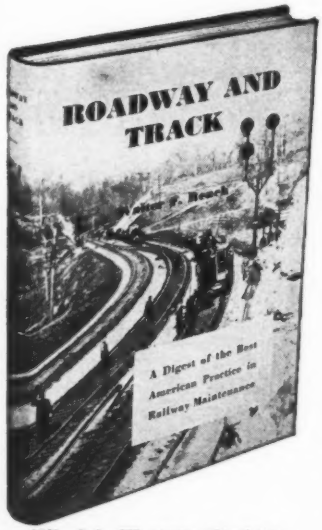
PITTSBURGH 19, PA.

New Third Edition

ROADWAY AND TRACK

By Walter F. Rench

Formerly Supervisor on the Pennsylvania Railroad;
Author of *Simplified Curve and Switch Work*



1946. 3rd. 350 pages, 101 photographs, 19 line drawings, 12 tables, index, 6 x 9, cloth, $5.00

The new edition features the use of the latest mechanical equipment in connection with roadway and track maintenance. Older methods employed where full mechanical equipment is not available are also explained. While most of the methods described are those which are standard on the *Pennsylvania,* A.R.E.A. recommended practices and those in use on other well maintained roads have also been included.

Outstanding types of mechanical equipment used in track work are described and illustrated with action photographs. Engineering drawings show working details. The economies resulting from the adoption of modern methods are clearly outlined. Useful tables have been added to make the book suitable for reference use, as well as a practical handbook on modern methods.

For Track Supervisors

While written primarily to serve the needs of track supervisors and other maintenance officers, the new edition contains material of considerable interest to transportation and mechanical officers who require a working knowledge of the fundamentals of maintenance of way practice. Section and extra-gang foremen, who wish to acquire a broader knowledge of their work and of methods used elsewhere, will find the book helpful.

CONTENTS

Part I—ROADWAY: Essential Elements in Roadway Maintenance—The Right of Way—Drainage of Roadbed and Track—Vegetation for Banks—Economics of Roadway Machines—Labor Saving Methods and Devices in Roadway Work—Small Tools and Their Uses.

Part II—TRACK: Essential Elements in Maintenance of Track—Program for Maintenance of Way and Structures Work—The Track Obstruction—Power Machines and Equipment—Labor Saving Methods in Track Work—Track Materials and Their Uses—Practice in Rail Renewals—Practice in Rail Repair and Inspection—Maintenance of Main Tracks—Maintenance of Yards and Terminals.

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R. E. & M. 4-48

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With new or modernized auxiliary equipment constantly coming along, "Caterpillar" track-type Tractors have extended their usefulness far beyond their original scope. Their greatly increased versatility is benefiting railroads no end—especially in right of way equipping and maintenance. These tractors find things to do even before they climb down off the work train—as witness the scenes above.

There, in the Pere Marquette district of the C. & O., a D6, equipped with a recently introduced Hystaway, is seen starting out by stringing 39-ft., 110-lb. rails at the swift rate of 100 to 120 per hour. Only a vivid imagination can picture all the other jobs it can take on after it hits the dirt. With bucket, clamshell, hooks or sling, it can handle ballast, build shoulders and culverts, move bundles of ties, et cetera. With Hystaway demounted (accomplished in an hour or less), the jobs it can do with the bulldozer are equally varied. "It's great stuff!" say section men.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

"CATERPILLAR" D4 WITH BULLDOZER AND HYSTER SIDE BOOM is another unit that is writing records of versatility and efficiency for the C. & O. Here it is shown laying rails. It also works with stone boat to distribute material for new trackage. (Price of the standard model D4, with gasoline starting engine, is $3925; the D6, $6240—both without auxiliary equipment. Both prices F.O.B. Peoria, subject to change without notice.)

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Ten men — including tools and fully loaded trailers—get to their work safely, in any kind of weather with this Fairbanks-Morse 44B Motor Car. Here's the rugged maximum-crew car that's a proved "work horse" on the rails! Fairbanks, Morse & Co., Chicago 5, Ill.

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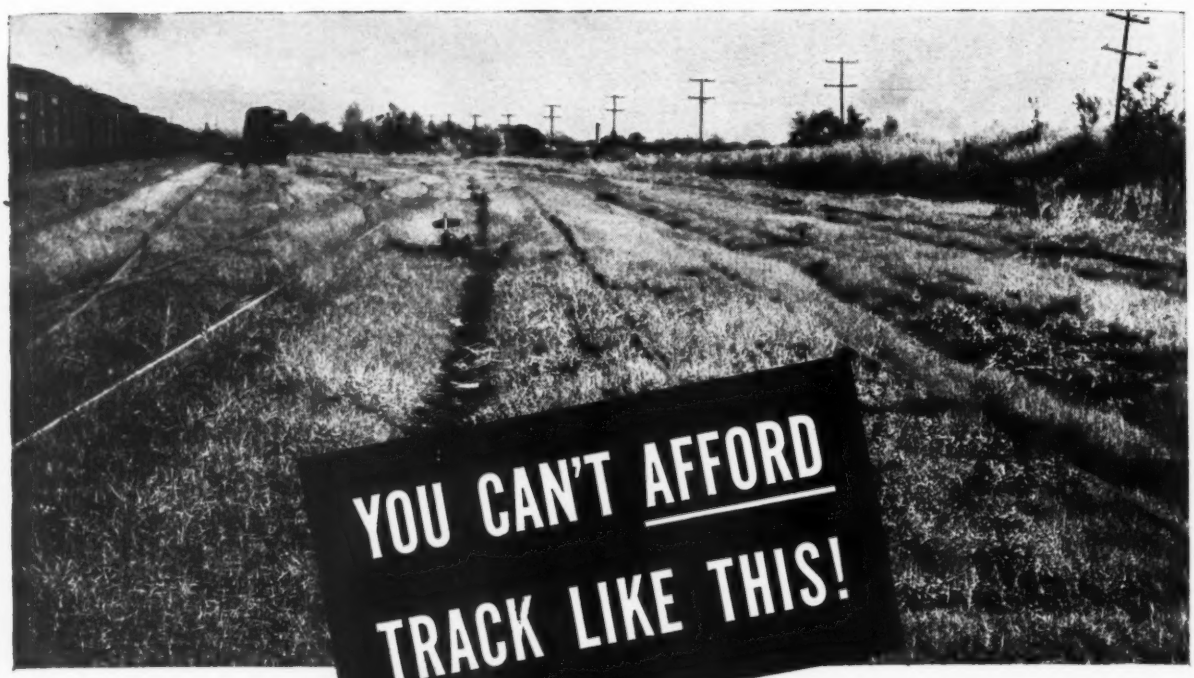

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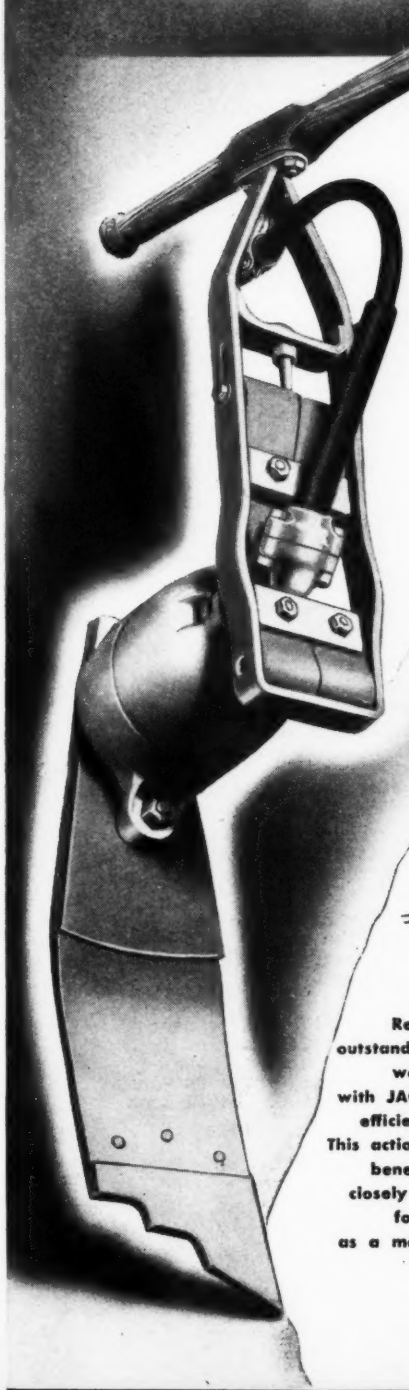

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No. 232 of a Series

Railway
Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION

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Subject: Your Thoughts Solicited

April 1, 1948

Dear Readers:

Both the Roadmasters' Association and the American Railway Bridge & Building Association, in the interest of increasing their memberships and broadening the value of their activities to the railways and those engaged in roadway and structures work, are considering the desirability of establishing regional chapters, or sections, in several parts of the country. One of the primary benefits in mind is to bring, in a measure at least, to those located distant from Chicago who can seldom, if ever, attend their annual meetings, some of the special advantages of convention attendance.

For example, it is thought that there might well be Pacific Coast chapters of both associations, which would meet at least once a year, with their annual meetings, possibly concurrent, approximately one month after the concurrent annual meetings of the parent associations in Chicago in September. Features of these regional meetings would include an on-the-spot report of the Chicago conventions by those who were at these meetings from the region; the presentation of the association committee reports, to be followed by discussions; and special addresses or papers as might be arranged by the officers of the local chapters. These meetings might be of one or two-day duration, as may be desirable, and might, on occasion, be participated in by the presidents or other officers of the parent groups.

By joining the national groups, members would automatically become members of the regional groups, and would have all of the rights and privileges of the parent groups, in addition to those of the sectional groups. Thus, members of both associations at points distant from Chicago would have a special incentive to retain their memberships, and many others eligible for membership might be encouraged to join the associations—even though they might be able to attend the annual meetings in Chicago only at widely spaced intervals.

What do you think of this idea? With a keen interest in the welfare of these associations, I am particularly interested to hear from you members of both associations who, "out on the limb," as it were, will have for the first time, under the suggested plan, a convenient opportunity for real participation in association activities.

And how about you eligible supervisory officers in the roadway, bridge, building and water service departments, remote from the Central West, who may have given up any thought of joining these associations because of the difficulty of attending their conventions?

I think it is a great idea, but it is not a question of what I or others located in the Central West think, but rather what you men—the men to be benefited most—think. Would you take a greater interest in the associations? Would it stimulate increased memberships from your area? What are its disadvantages, if any?

Although I am a present officer of the Roadmasters' Association and a past officer of the Bridge & Building Association, this letter is unofficial in character. But it is designed, through your comments, to be of help to both associations in deciding what they should do—in the interest of greater service to the railroads and to you men individually out on the firing line. May I look forward to hearing from you?

Sincerely,

Neal D. Howard

NDH:jb

Editor

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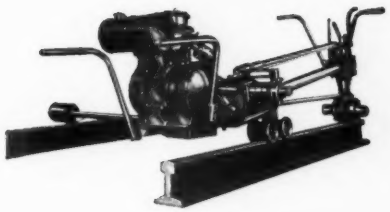

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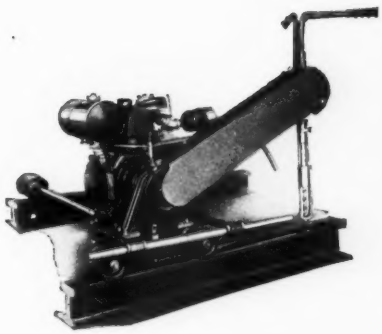

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Railway Engineering and Maintenance

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APRIL, 1948

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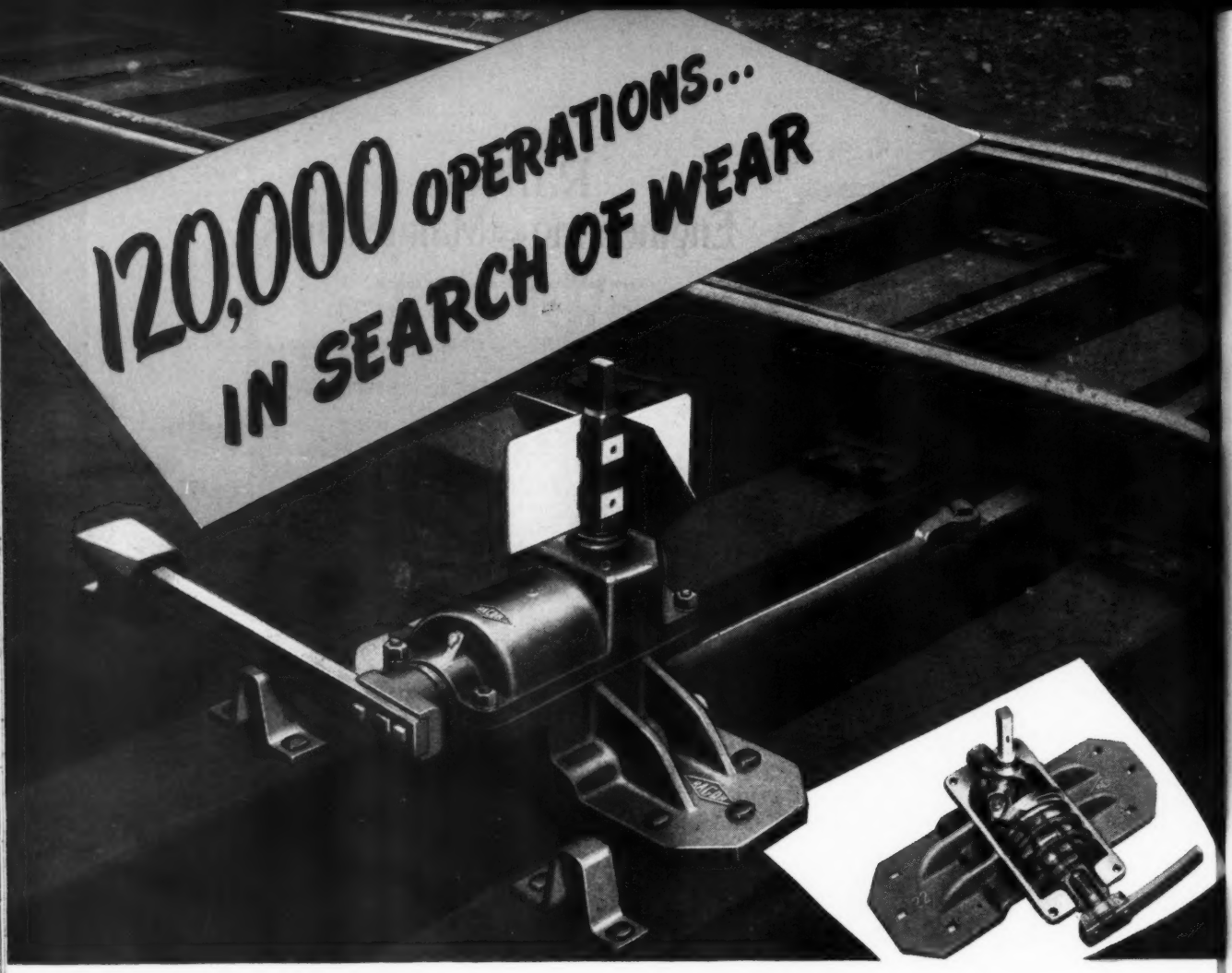

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Railway Engineering and Maintenance

Associations—

A Study in Membership and Convention Attendance Figures

The annual convention of the American Railway Engineering Association has come and gone. It was a great convention in many respects. In its review of committee work, addresses and technical papers, it was outstanding, and no doubt, again, there was almost as much accomplished in the informal swapping of notes by members outside the convention hall as in it. The attendance, too, was encouraging, including as it did 940 members and 750 guests, a total of 1,690, compared with a registration of 825 members and 665 guests, a total of 1,490, at the 1947 meeting.

But large as this year's attendance may seem at first glance, analysis of it indicates that it was far from what it might well have been in the interest of the association, of many specific roads of the country, and of hundreds of eligible engineering and maintenance officers who were not present. Here are some of the facts.

In the first place, of the 1,690 who registered, only 1,087 were men actively employed on the roads of the United States and Canada, while 603 were railway supply men or others not directly employed by the railways. Furthermore, of the total number of active members of the association from these roads (1,608), as published in the association's current year book, only 744 registered their attendance at the convention. Broken down in another way, the figures show that 54 of those in attendance were chief engineers; 29 had the title of assistant chief engineer, or were regional chief engineers; 11 were district engineers; 25 were engineers maintenance of way, system; 21 were regional or assistant engineers maintenance of way; 84 represented the bridge and building departments with division, region or system status; 128 were division engineers; 54 represented the water service department, including chemists, with division rank or higher; and 230, from mechanic to supervisor of work equipment, represented the large number of employees on the railways in responsible charge of the maintenance and repair of a vast amount of power machines and tools now being employed by the construction and maintenance forces.

Other railway men registered at the convention included many with subdivision rank in the roadway and bridge and building departments, assistant engineers, and a range of division, region and system officers with largely office responsibilities. A few roads, including the New York Central, the Pennsylvania, the Santa Fe, the Missouri Pacific and the Illinois Central, were well represented, but others were equally conspicuous because of their small representation or lack of representation whatever. Furthermore, except for the closer proximity of their lines, and thus the bulk of their engineering officers, to Chicago, it is difficult to understand why roads like those mentioned have memberships ranging from 146 to 60 (not including those retired from active service), while roads with equal or greater mileage have far less representation.

These are interesting facts arising out of the recent annual meeting—and they are not too encouraging facts, because they indicate that, for one reason or another, many roads, and hundreds of railway engineering and maintenance officers, are not reaping the full benefits possible through active participation in A.R.E.A. work. And in a still more striking way, it is certain that an analysis of the attendance at the last annual meetings of the Roadmasters' and Bridge & Building Associations would show the same relative situation.

True, there is much to be gained in all of these associations through their committee work and published reports, without convention attendance, but perpetual attendance by proxy is neither conducive to strong associations

nor to maximum benefit to members and their roads. Furthermore, it is only too evident that there are hundreds of railway officers who belong to none of these associations and take no part in their activities whatever because they get no encouragement from their managements and superior officers, or are actually deprived of an opportunity to participate, except by remote control.

Obviously, all railway engineering and maintenance officers cannot leave their posts at the same time to participate in association activities, but attendance at recent railway conventions, including those of mechanical department officers, as well as those of the roadmasters and bridge and building groups, indicates that a lot more of these officers could have left their posts than did. And certainly a larger number of railway officers could be encouraged by their superiors to take an active part in association work than actually do.

By past standards, A.R.E.A. membership is in no weak condition. According to the secretary's report presented at the recent convention, there was an increase in membership of 118 during the past year, which resulted in a greater net increase in membership during the last 12 months than in any corresponding period since 1929. Of even greater interest is the secretary's statement that the total of 2,334 members as of February 1 of the present year indicates as increase of 454 members or about 24 per cent, over the number on March 1, 1939, when the membership reached a low level as the result of the depression. Congratulations—but the facts presented in the foregoing indicate unmistakably that there is "still room" if the association is to achieve the greatest good for all concerned.

Sliding Fills—

Grouting Proving an Effective Antidote

ADVANCES continue to be made in the science of roadbed stabilization. Outstanding among the latest developments is the application of pressure grouting to the stabilizing of sliding fills. Already work of this type has been carried out on a considerable scale on a number of roads.

Under the sponsorship of the Committee on Roadway and Ballast of the American Railway Engineering Association, the research staff of the Engineering division, Association of American Railways, is conducting an extensive investigation of roadbed stabilization by grouting. The report for this year, presented at the convention last month, dealt primarily with the stabilizing of slides by grouting, describing instances in which such work was done on five large systems.

Supplementary remarks by Rockwell Smith, roadway engineer of the Engineering division research staff, indicated that "in all cases, the work has been very successful in stabilization." "For the limited length of time the work has been under service," he said, "the maintenance costs reported have shown a saving sufficient to amortize the cost of the stabilization usually within four years". It appears, therefore, that here is another effective means of reducing excessive maintenance costs, which may prove particularly timely this year in view of the extremely wet spring season that is now being experienced in some parts of the country, with an increase in roadbed instability.

At the same time it is well to bear in mind the fact that behind every sliding fill there is a definite cause or combination of causes, always involving the presence of moisture, and that grouting does not necessarily correct or remove these fundamental conditions. Consequently, it may be desirable, in the interest of achieving permanent results, to give careful consideration to the possible necessity of accompanying particular grouting projects, in at least some cases, with supplementary measures designed to correct the underlying conditions.

Concrete—

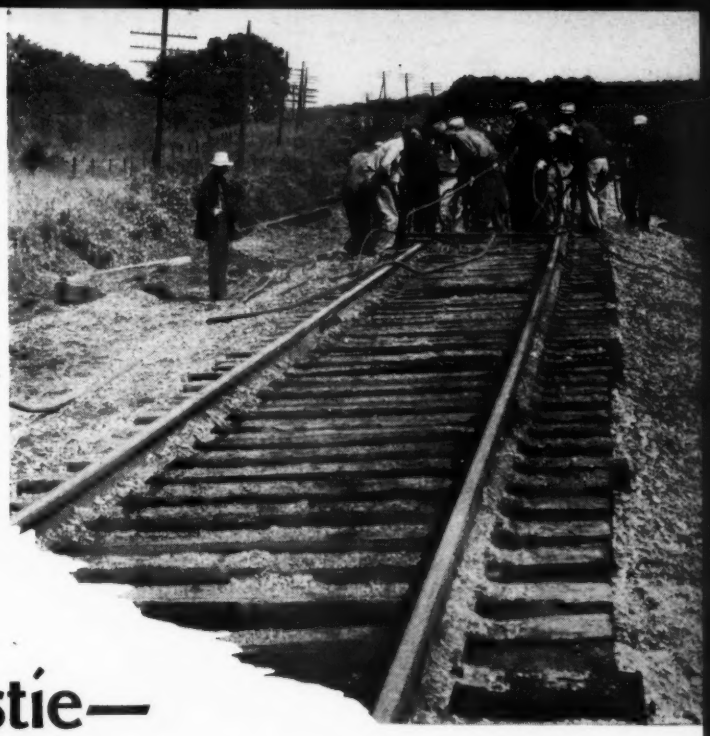
Using Present Knowledge as Research Goes on

GREAT strides have been made in recent years in the technique of concrete manufacture. As a result, knowledge is now available which, if properly applied, permits greater control over the quality of the product than was formerly possible. Notwithstanding these advances there is plenty of evidence to indicate that the results being obtained with concrete are still not all that they should be.

At least a partial explanation of this situation lies in the fact that, either through ignorance or negligence, full advantage is not always taken of the knowledge that is now available pertaining to the design of mixes or the manufacture of concrete in the field. In this connection it is well for those responsible for such work to remain mindful of the fact that concrete design and manufacture, whereas formerly a rule-of-thumb procedure, is now an exact science; that it is just as important to follow the prescribed rules regarding the proportioning of mixes, aggregate selection, water control, mixing and curing in concrete production as it is to employ a certain mathematical procedure in designing a steel bridge.

Recognizing that the results now being obtained with concrete structures on the railroads frequently leave much to be desired, we are presenting in this issue the first of a series of articles on the subject by a widely-known authority—A. J. Boase, manager, structural bureau, Portland Cement Association. It is thought that this series will provide much valuable information for those who have not heretofore had an opportunity to familiarize themselves with the fundamentals of concrete design and manufacture; that it will constitute a "refresher" course for others who may have become "rusty" on the subject; and that it will serve to turn the spotlight on a phase of railroad engineering that seems not always to have received the attention it deserves.

Meanwhile, there is a continuing struggle to acquire information that will advance the art of concrete manufacture even further than its present state. One phase of this effort was outlined by Dr. Ruth D. Terzaghi in a paper before the recent convention of the American Railway Engineering Association. In substance, the procedure to be followed will involve the careful study of existing concrete structures in an effort to determine the factors that have produced success or failure. Railway men, while profiting by the progress already made, as outlined in the articles by Mr. Boase, will be looking forward with interest to the results of this new investigation.



A track-raising project on the Santa Fe, where 9-ft. ties are being spotted in

This article, which is adapted from the recent report of the Committee on Ties of the American Railway Engineering Association, dealing with tie dimensions, reviews the past recommendations of the committee in favor of a 9-ft. length, and reaffirms those recommendations without qualification. It also includes statements of endorsement of the 9-ft. tie by the chief engineers of the Santa Fe and the Atlantic Coast Lines, both of which roads have used ties of this length for several years.*

Nine-Foot Crosstie—

Gets Clean Bill of Health

THE COMMITTEE on Ties of the American Railway Engineering Association, at the annual meeting of the association in Chicago, March 16-18, reaffirmed its recommendations, adopted in 1942, and now appearing in the Manual—(a) the adoption of 9-ft. ties and the discontinuance of the purchase of 8-ft. ties as rapidly as practicable and economical; (b) the use of 9-ft. ties at least for lines of heavy traffic; and (c) the adoption of the 9-ft. length wherever a change is made from the 8-ft. length.

At the 1939 convention of the association this committee presented an analysis of the functions of the crosstie and showed that ties were too short to be most efficient in spreading the concentrated load from the rails and tie plates over the ballast and subgrade. It was shown that because ties are too short, the practice of not tamping them at the center of the track is necessary as an expedient to avoid "center-bound" track. It was shown also that an increase of tie length permitted a decrease in the untamped (and thus wasted) part of the tie support at the center of the track, and it was demonstrated that with present rail sections a tie about 10 ft. long would be needed to permit the tamping of the entire tie length without noticeable tendency toward center-bound track. Because 10-ft. ties were considered as being too costly to be justified, however, the committee, in 1941, made the recommendations stated above, which were subsequently adopted for inclusion in the Manual.

In discussing the factors for and against the change to longer crossties, the committee, in its latest report, said, in part, as follows:

"In our previous reports it has been shown that tie lengths in the past had resulted from practices relating to lengths of commercial lumber, without regard to the fact that the best tie length is a function of the gage of track. It has been shown that the longer ties provide additional support considerably out of proportion to the increased cost. The longer ties reduce the amount of wasted ballast at the center of the track, and for a given yardage of ballast will produce greater track support.

"The increased cost of longer ties has been shown to be less than might at first be assumed. Observation by this committee, confirmed by U. S. Forest Service representatives, and by commercial producers, indicates that comparatively few trees cut for ties will not make as many 9-ft. ties as 8-ft. 6-in. or 8-ft. ties. Stumps 2 to 3 ft. high, left as waste, are not uncommon. The cost of manufacture, whether by hand or saw mill is almost wholly independent of length. Some additional cost for treatment is to be expected, due to fewer trams per cylinder charge. Where commercial freight is paid the increase will be proportional to the increase in length. Costs for insertion are largely independent of length.

"That the committee's statements about increased cost of longer ties being minor are reasonable is supported by experience during the late war. The OPA fixed a price differential of 10 cents between 8-ft. and 8-ft. 6-in. ties. The result was that the 8-ft. ties could not be obtained because the producers elected to supply the longer tie at the 10 cent higher price. In other words, it did not cost them 10 cents more to produce the longer tie.

"It should be pointed out that in any comparisons between ties, the total cost in track, including insertion, transportation, treatment, etc., should be used, rather than the mere first cost of the tie itself. Present-day total costs, which usually are over four dollars per tie in track, justify better ties than when this cost was only half as much.

"The adoption of longer ties necessarily disturbs the appearance of the track, particularly where the practice has been to maintain a 'line side' and a 'gage side' to the track. A 9-ft. tie inserted in 8-ft. tie track (and centered, as it should be) must stand out 6 in. beyond the tie line, and this ragged appearance will continue until

*W. J. Burton, assistant to chief engineer, Missouri Pacific Railroad, St. Louis, Mo., was chairman of the subcommittee which prepared this report.

renewals have removed all of the shorter ties. The appearance of track is, of course, important, but perhaps less so than formerly, because present-day passenger trains invite much less track inspection from the rear car; the passenger is entertained otherwise than in observing the track."

About the time the committee recommended the 9-ft. ties, two large railroads (the Santa Fe and the Atlantic Coast Line) adopted this length as standard, and the committee stated that it seems likely that similar action would have been taken by other railroads if it had not been for the abnormal conditions resulting from "Pearl Harbor." The committee also stated that the experience of these two roads with the 9-ft. ties amply confirms the wisdom of their adoption, and included as a part of its 1948 report the two following statements by G. W. Harris, chief engineer system, Santa Fe, and R. S. Groover, chief engineer, Atlantic Coast Line, concerning the experience on these roads to date.

On the Atlantic Coast Line

By R. S. Groover

Chief Engineer
Atlantic Coast Line

We adopted the 9-ft. crossties in 1941 and since that date, up to and including September 30, 1947, we purchased a total of 10,512,995 crossties for all purposes. At the beginning we could only secure a small percentage of our ties in the 9-ft. length, and at present are only securing about 65 per cent in this length. Our records are kept in such a manner that I cannot give exact figures on number of 9-ft. ties purchased.

Our prices for crossties are based on 9-ft. length and we pay 5 cents less per tie when the 8-ft. 6-in. ties are furnished.

When the center section of a crosstie rests firmly on compacted ballast and transfers rail pressures equally with the remainder of the bearing area of the tie, there soon develops a condition commonly known as "center-bound" track, to which is attributable poor riding and distortion of line and surface of the rails. This condition is avoided by leaving untamped a section at the center of the track. With shorter ties, in order to balance inner and outer support of the rail, the untamped center section is greater than with longer ones. A 6-in. increase in the length of the ties used adds 12-in. to the available supporting length to be tamped, as the same amount of supporting area can be added on the inside as on the outside of the rail for balanced support. Therefore, where center-bound track is an eventual certainty with 8-ft. crossties, it is not nearly so likely to occur with 9-ft. ties, which provide 2 ft. additional available tamping length for balanced support of the rail. It is also true that 9-ft. crossties, well tamped, give more stable resistance to the forces that tend to distort the line and surface of the track than the shorter ones produce. These qualities result in reduced labor, and maintenance and operating economies in favor of the longer ties, and also make for smoother riding conditions at high speeds.

There has been some criticism of the change to a longer tie because of the irregular line of the tie ends that will result during the transition period. However, it has been our standard practice to maintain a ballast section three inches beyond the ends of the ties in order to obtain bearing support as near as possible to the end of the tie to add resistance to side pressure in the track. This section tends to make irregularities of length less noticeable than in lighter ballast dress. Even where the ends are exposed to view the advantages of the 9-ft. ties are too great to withhold its adoption because of unsightly conditions during the transition period.

On the Atchison, Topeka & Santa Fe

By G. W. Harris

Chief Engineer System
Atchison, Topeka & Santa Fe

The adoption of the 9-ft. crosstie as standard on the Santa Fe in 1938 was, in my opinion, one of the most important improvements that has been made to the track structure of our high-speed and heavy-traffic lines in many years. With the advent of high speed and heavier wheel loads, our study developed the need for additional rail support, increased tamping area, and greater resistance to lateral thrust. It was a matter of bringing our track structure up to present-day requirements.

In the program of railroad track construction there have been improvements in design and increase in the weight of rail; all the various fastenings have been improved; and since the early days when no tie plates of any kind were used, tie plates have increased in size and improved in design. The exception to all of these improvements in track structure was the crosstie, which, while it has been made resistant to decay, had changed little as to size of length.

We started our investigation of crosstie sizes on the Santa Fe in 1922, and at that time we adopted the 7-in. by 8-in. by 8-ft. tie as standard for main line tracks. In 1934 we again investigated this matter, and in 1935 went to a 7-in. by 8-in. by 8-ft. 6-in.

Showing 9-ft. ties distributed along the A. C. L. in advance of installation

tie for curves of one degree and over, and for both curves and tangents in our important main tracks in certain mountainous territories. In November, 1938, the 7-in. by 9-in. by 9-ft. tie was adopted as standard for tangents and curves in our most important main tracks and for curves of one degree and over in certain less important main tracks.

From our study of the question of tie length, the conclusions reached have been in harmony with those of the A.R.E.A. Tie committee and the Special Committee on Stresses in Railroad Track. The first report of the Tie committee on length of crossties, which was made in 1905, argued for a longer tie, as did succeeding reports. In its 1940 report the committee commented: "It is believed this (the 9-ft. tie) will result in ultimate economy, as well as stronger track." With this statement I am in hearty accord. Increased tamping area possible with the 9-ft. tie means that a 9-ft. tie will have 43 per cent more effective bearing area than an 8-ft. tie of the same width; and to again quote the Tie committee, I firmly believe in the statement made in the 1939 report of that committee: "An increase in the supporting power of the roadway may be obtained by the increase in the length of ties at less expense than by any other means."

War conditions resulted in inability to secure our entire requirements, and it was necessary to conserve the 9-ft. ties produced for line changes and other out-of-face insertions. However, since the 9-ft. tie was made standard in 1938, 2½ million have been inserted in our tracks; and during the past year we have been able to purchase greatly increased proportions of the 9-ft. ties. We do not as yet have sufficient out-of-face mileage of 9-ft. ties on which to develop the saving in labor cost of surfacing and lining as compared to similar track on 8-ft. ties; but I am satisfied that at the present high track labor rates, the increased cost of labor to surface and line track on 8-ft. ties will be greatly in excess of the increased cost of 9-ft. ties per mile per year.

Versatile Rollers Speed Paving Work at Widely-Scattered Locations

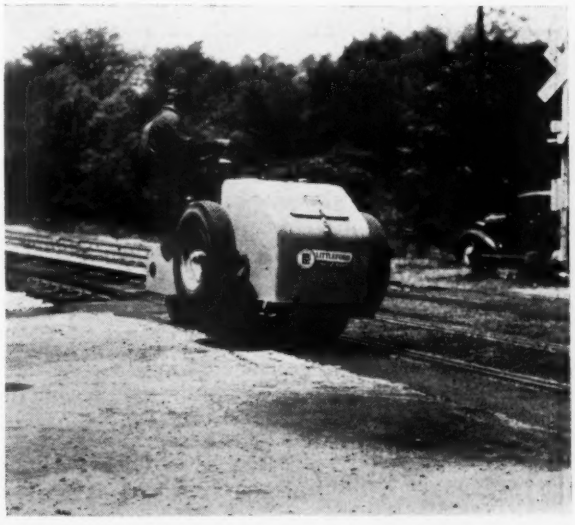
TO A constantly increasing extent the slow, laborious and only partially effective hand-tamper and hand-roller method of compacting water-bound and bituminous macadam pavements and platforms is giving way to the power-roller methods. Power rollers have not been unknown to this class of work on the railways for many years, for at least a few roads have had their own or have employed contractors' equipment of this type, but it has only been with the development of a relatively compact, readily-portable type roller, that power-roller compaction of bituminous surfaces is becoming quite general.

One roller of this type is shown in the accompanying illustrations—a motorized roller, the principal feature of which is that the main roller, when not in use, can be raised hydraulically to throw the major weight of the machine on two rubber-tired, truck-type wheels, for transportation of the unit over the road between jobs. Powered by a single-cylinder, four-cycle, air-cooled engine, and equipped with a front roller of the split type for easy steering, the unit is highly flexible on a wide range of paving construction and maintenance jobs and, with the completion of the work at any point, can be readily transported to a new location.

Inquiry among a number of roads indicates that, of those roads using this type roller, 2 have 3 each, 2 have 2 each, and 2 other roads each have 1. All indicate that they use the rollers for the same general purposes—the construction and maintenance of highway-railroad crossing pavements, platforms, driveways, parking areas, and pavement patching generally. In all cases, taking advantage of the pneumatic-tire mounting for highway movement, the practice is to tow the rollers from job to job behind motor trucks, using the trucks employed with them in paving operations. Two roads, however, point out that, at times, they load the rollers on flat cars for moves of any considerable distance. Loading in these instances is done by means of a crane, employing the bale hook with which the roller is equipped.

Consistently, the report is the same—faster work, more uniform compaction, a better-finished surface, the elimination of arduous hand operations, and a saving in labor.

A Power Roller Being Towed as a Trailer by a Truck. An Hydraulic Arrangement Permits the Main Roller To Be Raised Into Clear



Power-Operated Roller at a Highway Grade Crossing. Note Pneumatic Wheels for Transporting the Unit Between Jobs

How to Get Better Concrete on

Basic Principles

No. 1 of a Series

By A. J. BOASE

Manager, Structural Bureau
Portland Cement Association

IT IS now nearly 30 years since the law relating the various qualities of concrete to the water-cement ratio was promulgated. During at least the last 20 years this law, together with its relation to the design of concrete mixes and the production of concrete on the job, has received much publicity. As a result, most specifications now include some provision for controlling water content, either directly or indirectly.

Applying the principle, it is so easy to make concrete specimens of laboratory test size which have very high strength, are water-tight even under high hydrostatic pressure, and which have great resistance to the severest of weathering agencies, that one sometimes wonders why every concrete job, wherever it may be located, isn't 100 per cent perfect.

Speed Overemphasized

Nearly all concrete foremen boast of the large volume of concrete placed in a day, or of the record volume placed on this or that day. Unfortunately, however, the speed with which concrete is placed in many structures is responsible for some construction practices which are not conducive to the best results, and which often produce defective areas that are subject to early weathering. Trying to make speed records encourages the use of unnecessarily wet mixes, placing continuously in lifts that are too high, inadequate and non-systematic tamping and working of the concrete into place, and a tendency to dump the concrete into the forms at only a few points instead of distributing it more uniformly. Where speed is given priority, the mixer is run at full capacity (and sometimes more than the rated capacity), and the rest of the construction crew is usually required to keep up with it, whether or not adequate in size or well-balanced with men having the skills necessary for the job. Ostensibly, the provisions of the specifications are being carried out, but actually they are not in many of the details that are necessary to produce uniformly good results.

Unsound Materials

While a great preponderance of disappointing results can be accounted for by improper construction practices, this is not always the case. In some instances the materials used have not had the properties necessary to give satisfactory performance under the conditions of exposure prevailing on the job. A few unsound cements have been used inadvertently, due to lack of a test at the time that would have eliminated them, but there have been many more instances where unsound aggregates have been the cause of difficulty.

Autoclave Test

The cement industry has set high standards for itself and has developed new tests and testing procedures to control quality. One such test is the severe autoclave test, adopted as standard in 1943, which replaces the old test for soundness. Improved manufacturing processes also are constantly being developed and adopted. There is greater appreciation also of the influence of aggregate characteristics on the behavior of concrete, but easier methods than are now used for testing aggregates, particularly for soundness, are highly desirable.

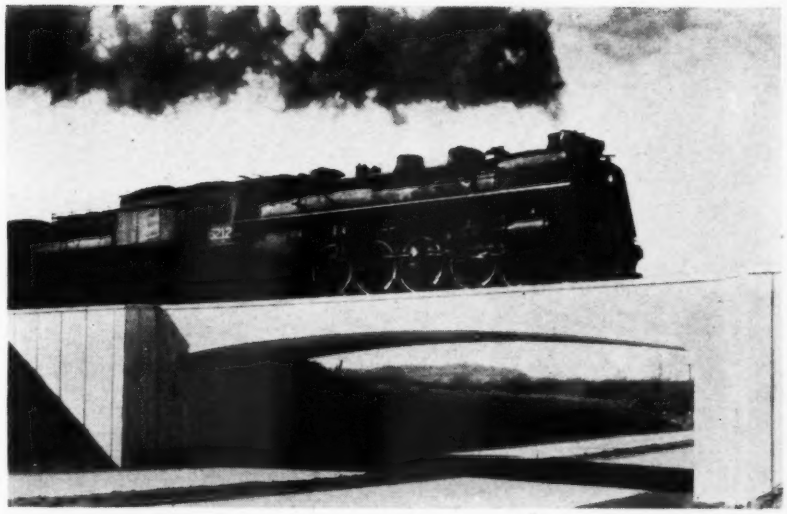
Foreword

RAILROADS have used concrete for over 50 years, in more ways, possibly, than has any other single industry. In general, its use has been based on sound economic and engineering principles, as is evidenced by the many early structures which have never required repairs and are still in use. Some concrete structures, however, have required considerable maintenance for one reason or another.

Recent reports of the American Railway Bridge and Building Association, the Public Roads Administration and other groups studying concrete structures have focused attention on the need for improving construction practices and for the more careful selection of materials in order to make sure of obtaining the durability and, consequently, low maintenance expense known to be possible with concrete. In an effort to help the railroads get better concrete in their structures, Mr. Boase has prepared for *Railway Engineering and Maintenance* a series of five articles, of which this is the first, on the fundamentals of concrete manufacture, including the design of mixes, control in the field, and proper methods of handling, placing and curing. Improper construction practices are discussed, and a warning is given against some of the pitfalls into which the uninformed user may fall.

In this first article the basic principles governing the properties of concrete are presented. Although parts of the discussion are elementary, and may appear unnecessarily so to many who may think they are well versed in these principles, there is altogether too much evidence that many of the elements have been neglected or are not well understood. Accordingly, basic principles are discussed, because it is necessary to have a thorough knowledge of these principles to understand the effect each has on the durability and economy of the finished structures.—Editor.

the Railroads



Modern railroad structures like this rigid frame, ballastless-deck bridge on the Canadian National at St. Hilaire, Que., require concrete of the highest quality if they are to give long service with minimum maintenance expense

In setting up the requirements for the concrete on a particular job there has been a tendency to overemphasize strength, without giving sufficient attention to durability. On many jobs concrete of relatively low strength will fulfill the requirements so far as load-carrying capacity is concerned, but such concrete is wholly inadequate for exposure to severe weathering. Bridge piers are a typical example. Usually large and massive, the unit loads are relatively low, yet many piers are exposed to flowing water and, in northern climates, are exposed to freezing and thawing while damp or wet. Such exposure constitutes an extremely severe condition because the expansion of the absorbed moisture as it turns to ice has a disruptive action, and is the most frequent cause of deterioration of concrete.

Freezing and Thawing Tests

In Fig. 1 are shown the results of laboratory freezing and thawing tests on mortar cubes. In these tests the saturated specimens are frozen and kept at a temperature of about 14 deg. F. overnight. They are then thawed in warm water and the process repeated. At regular intervals the specimens are weighed—the loss in weight being an indication of the amount of disintegration.

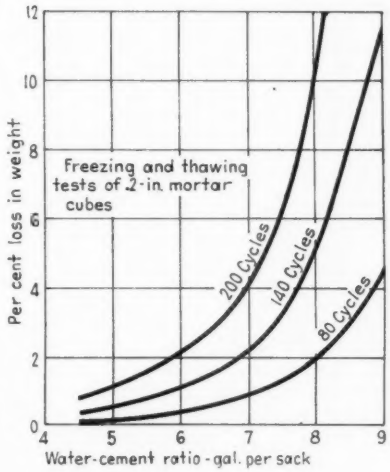


Fig. 1 (above)—Freezing and thawing tests show the effect of water content on durability

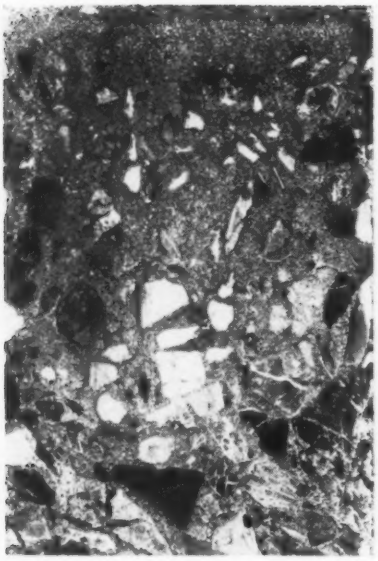
Left—Six-inch cubes after 100 cycles of the freezing and thawing test. Little damage has been done to specimens made with 5½ gal. of water per sack of cement (left tier); surface etching was apparent on specimens made with 7 gal. (middle tier); and 9-gal. specimens (right tier) show considerable disintegration

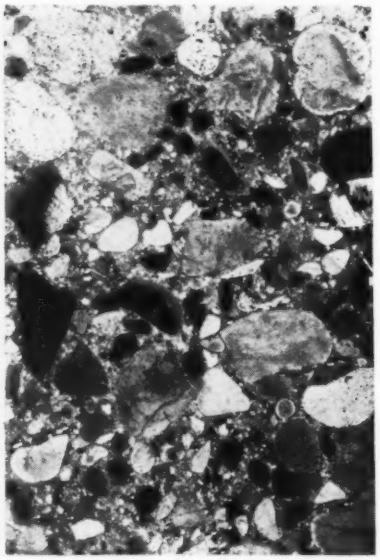
It will be noted that as the amount of water used in mixing the mortar is increased, the specimens become less resistant. For example, for a loss in weight of 2 per cent, mortar made with 6 gal. of mixing water per sack of cement withstood 200 cycles of freezing and thawing; mortar made with 7 gal. of water withstood nearly 140 cycles; and that made with 8 gal. withstood only 80 cycles. Concrete performs in the same manner as mortar. This is shown in the accompanying photograph of 6-in. cubes exposed to 100 cycles of the freezing and thawing test. While little damage was done to the concrete made with 5½ gal. of water per sack of cement, there is considerable etching of the surface of the concrete made with 7 gal., and much more damage to that made with 9 gal.

It is difficult to establish a definite relation between the artificial test and the number of years similar concrete will withstand natural weathering. Some time ago specimens which had been exposed to 20 years of weathering at Madison, Wis., without surface blemish, were put through the artificial test where they withstood only 30 to 40 cycles, indicating that concrete which goes through comparatively few cycles of the artificial test without serious injury would have very long life, even if located in severe climates.

Breakwater

The breakwater shown in another of the accompanying photographs is an example of a structure where the strength of the concrete throughout was more than ample to withstand the pounding of the water. In the sec-





When overly-wet mixtures of poor workability are used, the water and some fine materials rise to the top and the heavier particles of aggregates and cement sink to the bottom. When mixtures of proper consistency and workability are used, there is uniform distribution of the materials. These photographs of sections cut through hardened concrete show this

In this breakwater on Lake Michigan, the concrete in the section to the right was a lean mixture with a high water content. Concrete in the section to the left was a richer mixture with a lower water content, which accounts for its good condition after withstanding the severe conditions prevailing at this location for 25 years

tion at the right, however, the mixture was so lean and was made with such a high water content that the concrete could not withstand the freezing and thawing action. In the section at the left the concrete was made with less water and, as a result, has shown satisfactory resistance to the severe weathering action that is experienced at this location.

Watertightness—Segregation

Concrete in hydraulic structures must be watertight, but watertightness in all types of structures is also an indication of the concrete's ability to withstand weathering. Results of tests for watertightness by measuring leakage through mortar discs 1 in. thick when subjected to water pressure of 20 lb. per sq. in. are shown in Fig. 2. Mortar made with 5.6 gal. of mixing water per sack of cement and cured for 7 days showed no leakage, while that made with 7.3 gal. leaked at the rate of over 500 c.c. per sq. ft. per hour, and that made with 9 gal. leaked at the rate of more than 1,100 c.c. per hour.

It will be noted that in each case the leakage decreased as the mortar was cured longer, but that with the highest water content the specimens did not become watertight with the extended curing. These were very carefully made mortar specimens. The amount of mixing water for job concrete must be lower than indicated on the two upper curves of this chart to assure watertightness.

Weight Comparison

An aggregate particle weighs more than 2½ times as much as the same volume of water, and cement weighs over three times the same volume of water. These differences in weight explain the tendency for wet concrete mixtures to segregate. The wetter the mixture the more pronounced is this tendency. Where segregation occurs the water rises to the top of the concrete layer, while the heavier particles of cement and aggregate go to the bottom. The result is that the concrete at the bottom of the layer has a relatively low water content, and is therefore watertight and durable, but the concrete at the top of the layer is porous and subject to the deteriorating effect of freezing and thawing, even though, when proportioned at the mixer, the proper water-cement ratio was used.

Exposure to Weather

Accompanying photographs show sawed sections of specimens in which the segregation which took place in the overly-wet mixture is in marked contrast to the uniform distribution of aggregate and paste in the specimen where the concrete was of suitable workability. The photograph of the wing wall shows what happens to segregated concrete when exposed to weathering. The weak, porous concrete near the top of each layer weathers away while the stronger, more watertight concrete in the remainder of the layer is in good condition after many years of exposure to severe weather.

This is not an appeal for the very stiff mixes sometimes advocated. On the other hand, plastic, cohesive mixtures, which will not segregate under the conditions of placing, should be the aim on all concrete work.

Water Content Important

From the above discussion it is apparent that the first consideration on any particular job is the quality of concrete that will be required for the conditions of exposure. The potential quality bears a direct relation to the amount of water used in mixing, and recommended amounts for different exposures and types of structures have been established from many tests and from experience. A table of such recommendations will be given in a later article in this series.

The strength of concrete is also affected by the water content, as is indicated in Fig. 3, which shows the compressive strengths that may be expected with normal portland cement. Here it is shown that each additional gallon of water used in mixing the concrete reduces the strength at 28 days as much as 1,000 p.s.i. The chart also shows the increase in strength with age of concrete when it is cured moist. The strength at 28 days is more than twice that at 3 days, which, in turn, is two to three times that at 1 day.

Further effects of the length of the moist curing period are shown in Fig. 4. The concrete specimens for these tests were kept moist for different periods and were then placed in the air of the laboratory until tested. It will be seen that as the concrete dries,

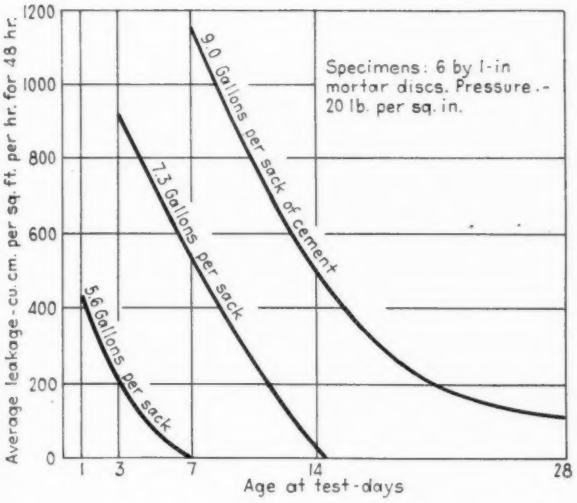
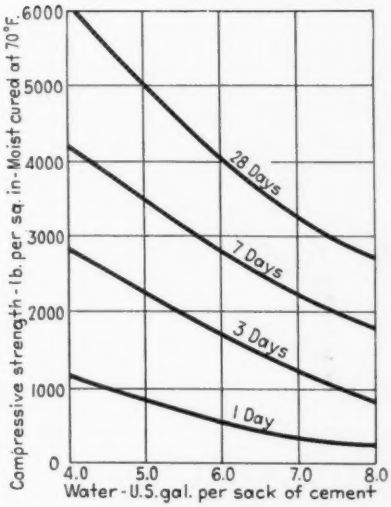


Fig. 2 (left)—Permeability tests show the effect of amount of mixing water and curing on the watertightness

Fig. 3 (right)—Age - compressive strength relation for concrete made with normal portland cement. Strengths indicated should be obtained on average construction projects where materials are carefully controlled



the chemical reactions between the cement and water, which increase strength, slow down, and that they stop upon complete drying. Concrete that was moist cured only 1 day was no stronger at the end of a year than it was at 1 month, and was only 60 per cent as strong as the concrete cured moist for 14 days.

Temperature

Like most other chemical reactions, the reactions between cement and water are affected by the temperature, being slowed down at temperatures below normal and practically stopping at temperatures below freezing. Fig. 5 shows the effect of temperature on the rate of gain in strength. It will be noted that concrete kept at 33 deg. F. for 28 days had little more than 50 per cent of the strength attained by the concrete cured at 70 deg., and that concrete cured at 16 deg. F. had less than 10 per cent of the strength of concrete which had been cured at 70 deg. F.

In these tests the materials were at room temperature when the concrete was mixed, and the specimens were kept at room temperature for the first six hours. Where the materials have lower temperature when used, and the concrete is exposed to lower temperatures from the time it is placed, the strength percentage, as compared to concrete made and cured at normal temperature, would be lower than indicated in this chart.

Referring again to Fig. 3, the strengths indicated are for a given set of conditions. These include plastic, workable mixtures which can be placed properly, average well-graded aggregates consisting of hard sound particles, concrete cured moist for the full period until tested, and also made and cured at a temperature of about 70 deg. F. For other moisture and temperature conditions during curing and for other materials, the strengths may be different, although the shape of the curves when plotted would be much the same.

In the next article of this series the selection of materials will be discussed.

The results of segregation and water gain are shown in this wing wall. The top of each lift containing the more porous concrete is eroded due to weathering, while the better concrete at the bottom of the lift is unaffected and remains in good condition

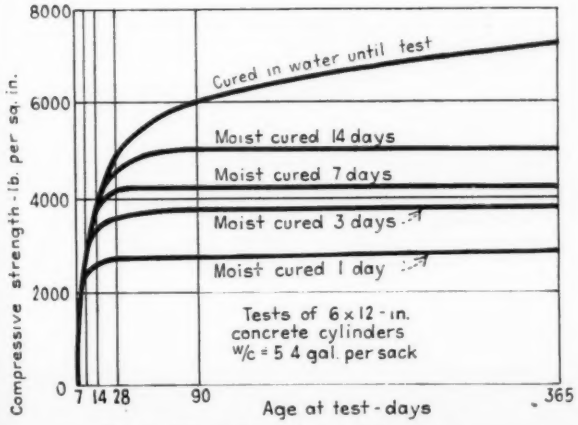


Fig. 4—Effect of duration of moist curing on the compressive strength of concrete

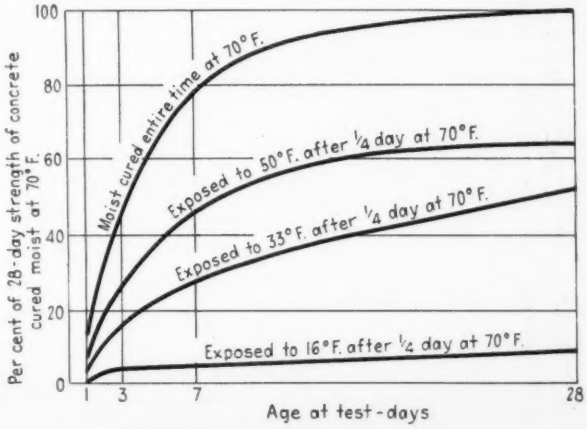
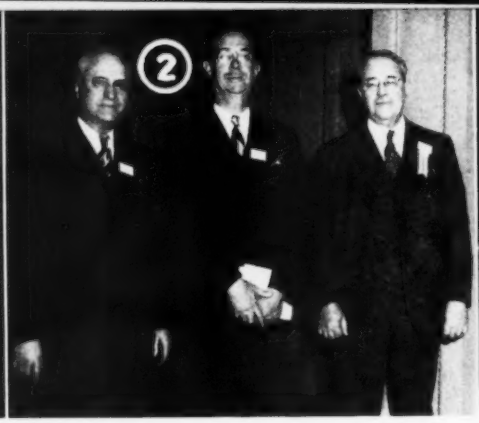
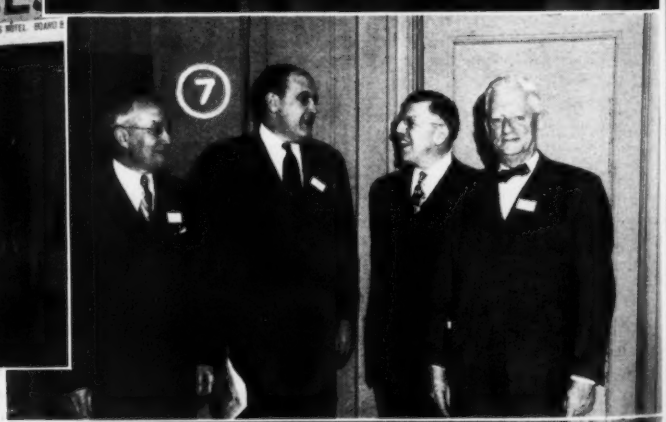


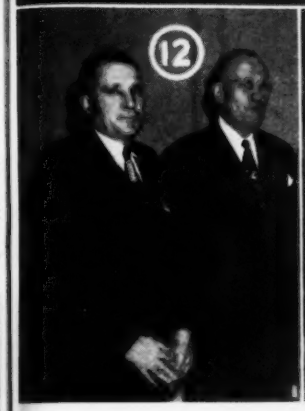
Fig. 5—Effect of curing temperature on the compressive strength of concrete



Seen at the A.R.E.A. Convention

Some informal groups as photographed at the Palmer House, Chicago, during the annual gathering of the American Railway Engineering Association, March 16-18





(All names read left to right)

(1) L. V. Johnson, W. J. Cable (both Soo Line); (2) E. Bennett, G. L. Sitton, A. B. Pierce (all Sou.); (3) Armstrong Chinn (T.R.R.A. of St. L.), president, A.R.E.A.; (4) W. A. Spell, R. L. Groover, L. E. Bates (all A.C.L.); (5) F. E. Yockey (M.P.), C. L. Fero (B.&M.), E. H. Ness (Erie), T. M. Pittman (I.C.), F. F. Zavatky (N.Y.N.H. & H.), G. R. Westcott (M.P.); (6) Walter Leaf (D. & R.G.W.), J. S. Vreeland *(Railway Engineering and Maintenance)*, F. W. Biltz (Reading), R. R. Cosby (K.C.S.), W. E. Cornell (N.K.P.), H. F. Durham (A.A.R.); (7) H. W. Legro (B.&M.), A. A. Visintainer and F. A. Schnell (both Erie), G. H. Dayett (B. & O.); (8) M. B. Allen, W. M. S. Dunn and W. E. Cornell (all N.Y.C. & St.L.); (9) A Santa Fe group including: R. H. Beeder, L. J. Riekenberg, R. W. Johnson, G. R. Collier, J. R. Rushmer, C. H. Sandberg, W. B. Darling, and G. M. Strachan; (10) F. E. Short (St.L.-S.F.), N. A. Powell (Armco Drainage & Metal Products, Inc.), G. M. Magee (A.A.R.); (11) F. H. McGuigan, J. Yarber, and R. P. Hart (all M.P.), G. L. Staley (M-K-T), P. P. Wagner (M.P.); (12) R. E. Nettingham and R. M. Leeds, retired (both L. & N.); (13) Maro Johnson (retired), R. E. Berggren, R. E. Buss, N. W. Kopp, J. C. Jacobs (all I.C.); (14) L. S. Crane (Sou.), Ray McBrian (D. & R.G.W.) and C. J. Code (P.R.R.); (15) A group of S.P. men including: G. L. Morrison, C. T. Ray, J. E. Wheeler, and R. C. Nissen; (16) A group of Erie representatives including: A. B. Fowler, H. J. Weccheider, R. L. Dyke, C. K. Scott and H. A. Pasman; (17) Guy Martin (I.C.), H. E. Silcox and R. C. Bardwell (both C. & O.); (18) G. M. Smith, P. S. Settle and J. W. Buford (all P.R.R.).

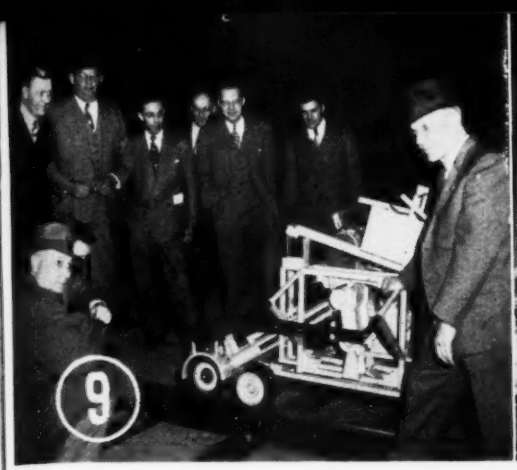
(See the Railway Age of March 27 for other candid views)

With a Candid

(All names read left to right)

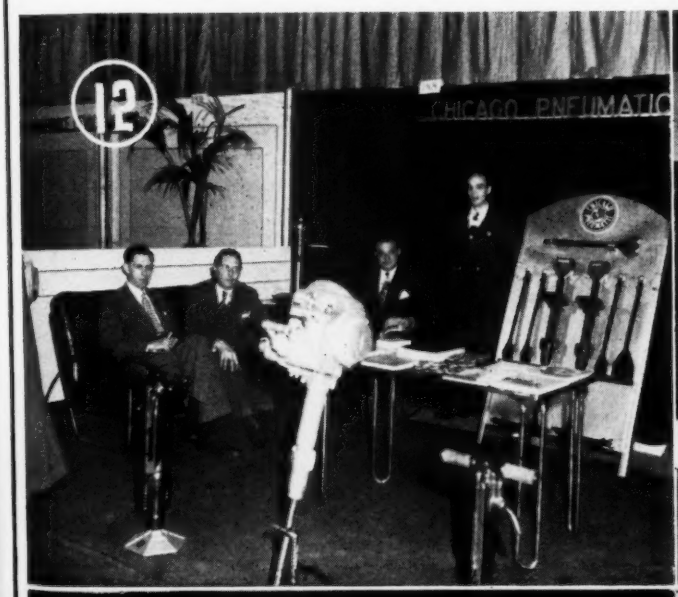
(1) Woodings-Verona Tool Works—C. K. Luyster, G. M. Snyder, W. H. Woodings; (2) Hubbard & Co.—N. A. Howell, A. C. Laessig, T. M. Pittman (I.C.), E. L. Banion (A.T. & S.F.), A. L. Fridley; (3) Rail Joint Company, Inc.—Frank R. Wood, R. B. Jones (C.P.R.), Thomas Ryan, Hugh Gordon, J. M. MacBride; (4) Railway Track-Work Company—John Moore, F. F. Zavatkay (N.Y.N.H. & H.), W. D. Hoffman; (5) Sperry Rail Service—W. P. Morrison, J. W. Dice, S. P. Murphy; (6) Kershaw Company, Inc. —J. W. Davis, J. P. Crow, Royce Kershaw, Knox Kershaw, V. E. Williams (Sou.); (7) Electric Tamper & Equipment Co.—J. M. Webb, H. W. Cutshall, Morton S. Westlund, A. B. Holt, J. R. Kanan (F.W. & D.C.) and W. C. Oest (F.W. & D.C.); (8) Eaton Manufacturing Company, Reliance Division—K. S. Cowlin (Electro-Refractories & Alloy Corp.), R. B. Little, F. K. Howell, E. D. Cowlin, S. E. Cowlin; (9) Nordberg Manufacturing Company—R. A. Stolle (kneeling, S.L.-S.F.), W. B. Blix, Stanley H. Smith, L. Loebel, D. Shumacher, E. E. Voss, F. E. Staffeld, H. H. Talboys; (10) National Lock Washer Company—D. W. Hallberg, H. Stone; (11) Maintenance Equipment Company—E. Overmier, Frank Wood; (12) Chicago Pneumatic Tool Company—J. J. Brown, C. D. Nicholls, H. R. Deubel, J. E. Hopping; (13) LeRoi Company—D. J. Hogan, J. H. Callahan, G. M. Hogan; (14) Harnischfager Corp.— B. Germershausen, B. Ballman, A. Rutkowski, P. C. Petry; (15) Ric-Wil Company— H. F. Wustman.

(See the Railway Age of March 27 for other views of the exhibit)



Camera at the N.R.A.A. Exhibit

Scenes at booths of a few of the 100 companies that displayed their products at Chicago during the A.R.E.A. meeting in March



Norse Make Scientific Attack on Heaving Track

To overcome serious frost heaving on sections of their lines, the Norwegian State Railways have found it necessary to take the drastic step of excavating the frost-forming soils under the track and substituting materials which do not expand materially upon freezing. This article, which is an abstract of a detailed treatise on the subject prepared by the author for presentation before the Second International Conference on Soil Mechanics and Foundation Engineering in the Netherlands in May, tells of the replacement materials being used, the most effective of which is a layer of pressed peat blocks, topped with gravel, crushed stone or cinders. So effective has this expedient proved in eliminating heaving, that plans are underway to pave the subgrade over approximately 300 km.* of line, which will involve the use of approximately 1,600,000 peat blacks, 1 m. by 0.5 m in plan, and from 0.3 to 0.5 m. thick.

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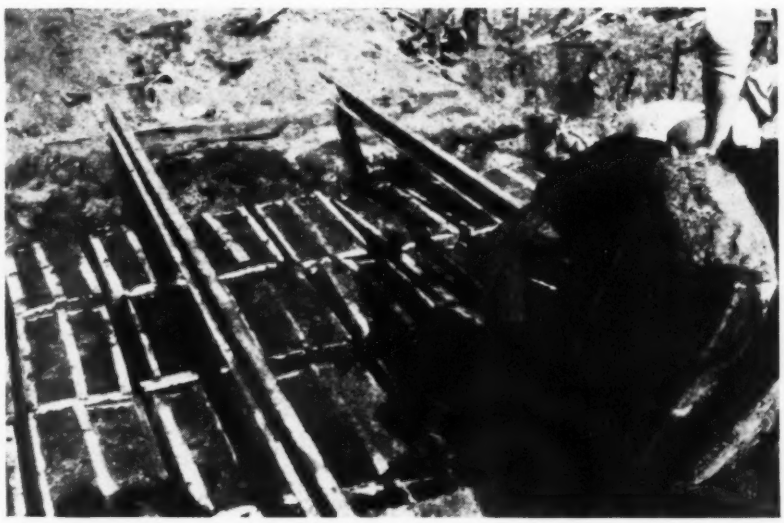


Fig. 1—Laying in the peat blocks under a section of excavated track. Note that baling strips and wire are left in place

FROST heaving is a very serious economic and technical problem for Norwegian roads and railways—a problem that is due primarily to severe winter cold encountered and the extensive occurrence of fine-grained sediments and moraine deposits. A section through frozen and strongly frost-heaving soil reveals a series of isolated and nearly horizontal ice layers that can vary in thickness from 1 mm. to 100 mm. These ice layers are often limited in horizontal extent and are thickest through the middle section. A local accumulation of a number of such lens-shaped layers often manifests itself at the surface by marked and sharply defined "frost humps."

The formation of the ice layers is due to special physical conditions during the process of freezing, which only in recent years have been made clear. The water is furnished by capillary action in the underlying unfrozen soil, and this movement is stimulated by forces of diffusion through films of water at the lower limit of the frost zone. If this limit remains unchanged for a period of time and the temperature is sufficiently low, the thickness of the ice will increase. It is the resultant surplus of water that gives the ground a nearly fluid consistency after the spring thaws.

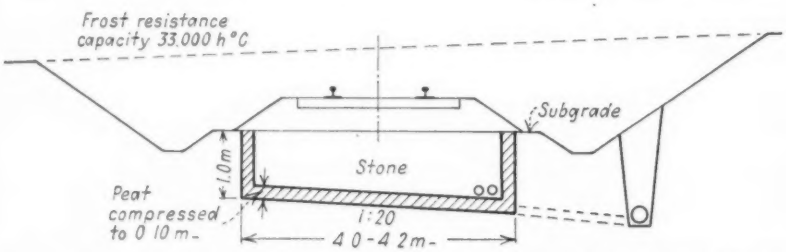


Fig. 2—A normal replacement section used in new construction before World War II, showing lining of compressed peat and backfill of crushed stone

The Norwegian State Railways were forced at an early stage to take up the battle against the evils of frost. The main difficulty is the uneven swelling of the ground due to frost, as any relative vertical displacement of one or both rails approximately 10 mm. or more constitutes a menace to traffic and a hindrance to the development of speed.

Methods Used

The measures that have been taken against destructive frost heaving are drainage, lifting of rails (raising on stone ballast), and soil replacement. Attempts to drain the ground under the subgrade by means of longitudinal coverage drains on one or both sides of the line have sometimes produced good results. But very often the soils

*The American equivalents of the metric terms used in this article are as follows: m.—meter = 39.37 in.; mm.—millimeter = 0.0394 in.; cm.—centimeter = 0.3937 in.; km.—kilometer = 1,000 meters or 3280.8 ft.; kg. = 2.2 lb.

involved are so fine-grained that even drains 3 m. deep will not suffice to lower adequately the level of ground water drawn up by capillary action. This is true of clay and clayey soils as well as of silt. Experience has shown that such drainage reduces frost heaving, particularly in cracked ground and in silt, but rarely can it eliminate shimming altogether. Drain-

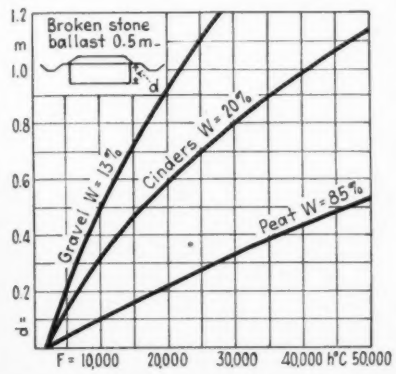


Fig. 3—Necessary depth of replacement d (in meters) for different materials, depending on the amount of frost F

age intended to prevent frost heaving should not be undertaken unless examination of the ground has indicated the possibility that the ground-water level can be lowered adequately by that means.

Raising of the track by increasing the ballast depth from 0.5 m. to, say, 1.0 m., can make possible the elimination of shims in cases where the ground conditions are favorable—especially, perhaps, in that the frost heaving becomes evenly distributed and, therefore, harmless. But on stretches with difficult conditions of ground frost this measure does not by any means suffice.

The most effective, but also the most expensive, method of preventing heaving is soil replacement. Under this method the soils that are susceptible to frost heaving are removed and replaced by materials that do not expand much upon freezing. The excavation must be sufficiently deep that the frost, even in the most unfavorable winter, cannot penetrate to the roadbed. The width of excavation is equal to the length of the ties, plus 1.50 m., or from 4.0 or 4.2 m.

Soil Replacement

Soil replacement has been carried out on our lines more or less systematically since the beginning of this century. Gravel, broken stone or peat has been used as the replacement material on new lines, and locomotive cinders have been used with good results on lines already in operation.

The proportions of the soil replacement section used before the last war were somewhat too rigidly fixed. Particularly in new construction, a so-called "normal" section had evolved in which the depth of the excavation was 1.0 m. below ground level and the filling material was stone. The bottom and sides of the trough were lined with peat (Fig. 2). This lining of peat, which originally was 0.2-0.3 m. thick, was intended to prevent the surrounding fine-grained materials from penetrating into the layer of stones.

It was discovered that such a replacement section eliminated the need for shimming on certain stretches, while it failed to prevent destructive frost heaving on other stretches, even where it was not particularly cold. Investigations showed that the layer of peat at the bottom sometimes was displaced, and in patches entirely lacking—probably because of the careless

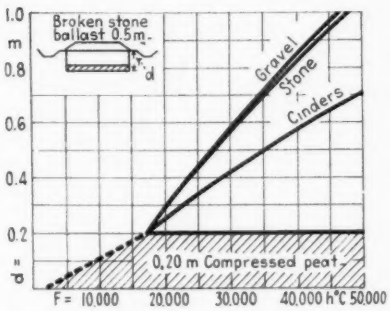


Fig. 4—Necessary depth of replacement d (in meters) when there are 0.20 m. of pressed peat in the bottom of the trough, and gravel, stone or cinders above

dumping of stone. At such places troublesome frost humps occurred, even where the stones were not mixed with the soil. On the other hand, there was direct evidence that any layer of peat at the bottom of the trough—even as thin as 0.05 m.—effects some insulation against frost.

Theory Involved

The frost problem is a many-sided and difficult one, which can be solved only by systematic studies of soils, ground water and temperature conditions, to mention only a few of the factors involved. It has commonly been observed, for example, that frost penetrates but little into a marsh, but probably few people realize that this is due primarily to the great water content of the peat, and not so much to its poor conductivity of heat. As a matter of fact, it has been specifically demonstrated that frost penetrates deeper into dry peat than into wet, and the explanation of this, according to physics, is that the larger the quantity of water to be frozen, the larger the quantity of heat to be reduced.

The depth of the frost depends on two dominant factors, namely, the amount of local frost and the thermostatic constants in the ground. The amount of frost (F) is defined as the product of time and degrees temperature, from the time in the autumn

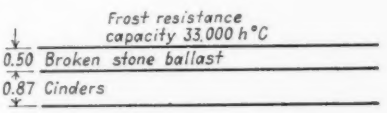


Fig. 5—For moderately cold districts, cinders have been used as replacement material with good results

when the accumulation of cold begins, to a point of time in late winter, when the accumulation ceases. Subtractions are made for mild periods, and the amount of frost (F) then becomes a collective figure for that part of the winter cold which increases the depth of frost in the ground.

Another important set of factors in determining the depth of frost is the ability of the soil to conduct heat and to accumulate cold. Since both of these factors are strongly dependent on the water content, much work has been put into determining the amount of water that the different soils or replacement materials have in their proper locations along the line. A great quantity of water stores up a great quantity of cold when it is transformed into ice, and thus it impedes the further penetration of frost. On the other hand, the conductivity of

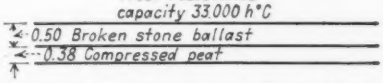


Fig. 6—Shows the necessary depth of peat layer for the same moderately cold district referred to in Fig. 5

heat increases in direct proportion to the amount of water, and this tends to aid the penetration of frost. The problem, therefore, is to select replacement materials, or combinations of these materials, deposited in a succession adapted to the needs of each particular situation.

Depth of Replacement

In Table I, the per cent water volume for the most commonly used materials are given.

Table I

Substance	% Water by Volume
Hard-packed snow	50
Ballast stone	8
Ballast gravel	13
Cinders (incl. ash)	20
Peat	85

Fig. 3 shows the necessary depth of replacement d. (thickness of layer in meters) for different materials, depending on the amount of frost F. This pre-supposes an 0.5-m. deep ballast section of stone which, after freezing through, is assumed to be covered by a layer of hard snow averaging 0.06 m. in thickness. While stone and gravel alone are inferior replacement materials, cinders, and above all peat, are excellent. Those replacement materials which have the greatest water content are the best, as their ability to store up cold is of the greatest significance. For the ballast materials on top, on the other hand, the ability to conduct heat is more important, and it is desirable to have the ballast material as dry as possible.

Fig. 4 shows the necessary depth of replacement d when there are 0.20 m. of pressed peat at the bottom of the trough, and gravel, stone or cinders above. The combination gravel or stone on peat is economical in new construction. If the peat is unpressed, it should be deposited to a depth of at least 0.40 m., and care should be taken that it is not displaced.

To achieve the greatest possible combined resistance to frost in soil layers placed upon each other, the rule is, top layer (ballast) as dry as possible, and bottom layer as wet as possible.

Let us examine the standard section for new constructions before the war (Fig. 2) and evaluate it critically. The layer of peat at the bottom of the stone-filled 1.0-m. deep trough is usually pressed down to a thickness of 0.10 m. after a short time. This section has a resistance to frost of 33000 h°C, adequate for a moderately cold district in Norway, but inadequate for the cold inland and mountain regions. If the peat layer is only 0.05 m. in thickness, the resistance to frost is reduced to 24500 h°C, and if it is entirely removed, the resistance in the stone-filled trough is only 16000 h°C. Consequently, the peat layer, which has been deposited to insulate against infiltration of soil into the layer of stones, has great significance in combatting frost, and it can be assumed that the varying effectiveness of the normal section is due to the varying thicknesses of the peat layer. In the future, a thicker peat lining will be used in the stone-peat combination, and care will be taken to prevent the peat from getting displaced when the stone is dumped. It should be expected that loosely placed peat will compress to half the original thickness.

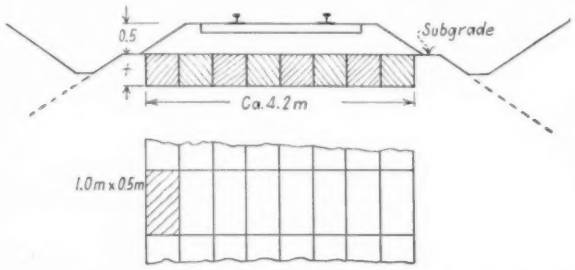


Fig. 7—Sketch plan and section of track, showing location and arrangement of pressed peat blocks

On lines already in operation, which so far have had a good supply of waste materials from the locomotive fireboxes (cinders, unburned coal, and ashes), this mixture—hereafter referred to simply as cinders—has been used with good results as replacement material. For a moderately cold district—take, for the sake of comparison, the same amount of frost (33000 h°C) as earlier—the computed thickness of the layer of cinders is 0.87 m. as shown in Fig. 5, i.e., a slightly shallower excavation than shown in Fig. 2. Loosely deposited cinders lose about 20 per cent depth when packed down and are, therefore, given a corresponding surplus depth. A considerable part of this compression is effected with the passing of the first train. As all grades of the cinders are evenly distributed through the mixture, it does not become adulterated by the surrounding soil.

Saturated Peat Blocks

As early as the beginning of the century, peat was laid down as a replacement material on a couple of sections, one of which was 600 m. long. This peat was placed in the trough in the form of half-dry clumps. Examination of the almost 50-year old experimental stretches, where the line still is shim-free, has shown that the originally loose peat has been pressed down to a half-thickness, and is now covered by a correspondingly thicker layer of gravel ballast. In spite of drainage from the trough, the peat is saturated with water, and since the peat has retained its fibrous nature, it apparently has not undergone any decay. It is still sharply defined in relation to the adjacent soil.

Fig. 6 shows the necessary depth of the peat layer for the same moderately cold district (33,000 h°C). Of all known replacement materials, peat that is compressed and soaked through requires the smallest depth of excavation.

Since 1930, pressed peat blocks have been used as replacement materials on operating lines. The blocks contain dried and torn peat and are baled with two wooden frames and steel wire. These blocks have a standard length of 1 m. and width of 0.50 m., while their thickness may be 0.30, 0.40 or 0.50 m., depending on the local amount of frost. Weighing from 50 to 90 kg., they are easily-handled units, and their form allows for temporary stacking along the line—an important consideration in narrow cuts.

As shown in Figs. 1 and 7, eight blocks are laid per meter of line (8,000 per km.). The blocks, with wrapping, are laid from the sides inward towards the center line, and the trough is dug so narrow (4.15 to 4.20 m.) that the two middle blocks have to be forced down. The peat fill formerly was tapered in depth towards the ends of the trough, but now it is ended abruptly, and no practical difficulties have resulted.

Volume Never Changes

During the first rainy autumn, the peat layer becomes thoroughly saturated with water. A large number of measurements has shown that whether the peat has lain in the line one year or fifty, the volume is very nearly the same. Summer and winter alike, the peat contains, in round numbers, by volume, 10 per cent peat, 85 per cent water, and 5 per cent air. The density of the layer, which can be expressed in terms of volume per cent peat, appears to differ but little from the original form before it was laid into the line. Light, undecayed peat has a compactness or density of about 8, and somewhat decayed, moderately dark peat about 10. It has been established that the first blocks, which were supplied to the ordinary market as standard agricultural products, were too loosely pressed, as they were quickly reduced by 20 per cent in the line. Even though this settling is no greater than that encountered with cinders, it is more troublesome because it makes itself felt materially, and necessitates more frequent adjustments of the rails through the year. Attempts are now made to eliminate this evil by the use of more firmly pressed peat blocks, which are required to have the same compactness, 8-10, as a peat-layer that has been installed for several years in the line.

The Norwegian State Railways have now laid down 0.3 to 0.5-m. thick pressed peat mats on scattered stretches totalling 17 km. Objections have been made to such a thick layer of

(*Continued on page* 409)

Treating Water for Diesel Locomotives

An aluminum air cooler head from a Diesel engine, showing corrosion after only nine months' service

This article is an abstract of a report prepared for presentation at the 1948 convention of the American Railway Engineering Association by a subcommittee of the committee on Water Service and Sanitation. M. A. Hanson, assistant engineer tests, Gulf, Mobile & Ohio, was chairman of the subcommittee. The report first discusses the problem of protecting the aluminum portions of Diesel cooling systems from corrosion, and then gives the results of a series of tests made during the past year to determine the feed-water requirements of the steam generators used on Diesel locomotives.

PREVIOUS recommendations made by this committee for the prevention of corrosion, scale and sludge in Diesel cooling systems are still believed to be valid and to represent the best known practice. As set forth in its report for 1947, these recommendations (limited to waters of a maximum of 23.2 g.p.g. of total dissolved solids) are as follows:

(1) Use only clear waters with turbidity not exceeding 1.0 g.p.g.

(2) Pretreat the waters to zero hardness.

(3) After-treat the water to maintain a minimum of 1½ lb. of sodium chromate per 100 gal. with a pH of 8.5 to 9.

(4) Maintain a hardness in the cooling system at all times below ½ g.p.g.

(5) Analysis at least once each week by the railroad's chemists to make certain these standards are maintained.

(6) Inspection of the cooling systems at overhaul periods to insure that the desired results are being accomplished.

A diligent search has been made for a substitute for chromates as a corrosion inhibitor, because chromates are relatively expensive and have been difficult to secure in adequate quantities. This search has been unsuccessful in developing any adequate substitute.

It is doubtful if the aluminum portions of Diesel cooling systems can be adequately protected against corrosion under all conditions. The extreme difficulty of adequately protecting aluminum from corrosion in a Diesel cooling system is due to the position of aluminum in the electromotive series. There is a potential difference of 1.61 volts between aluminum and copper and 0.93 volts between aluminum and iron.

The locomotive builders are increasingly recognizing this difficulty and are making progress toward the elimination of aluminum from the cooling systems. One of the major locomotive builders has seen the adverse effects of incorporating aluminum in the cooling systems on its locomotives and has eliminated the use of aluminum in contact with cooling water. Another major locomotive builder is using a special corrosion - resistant aluminum alloy for the parts in contact with cooling water.

Difficulties of Control

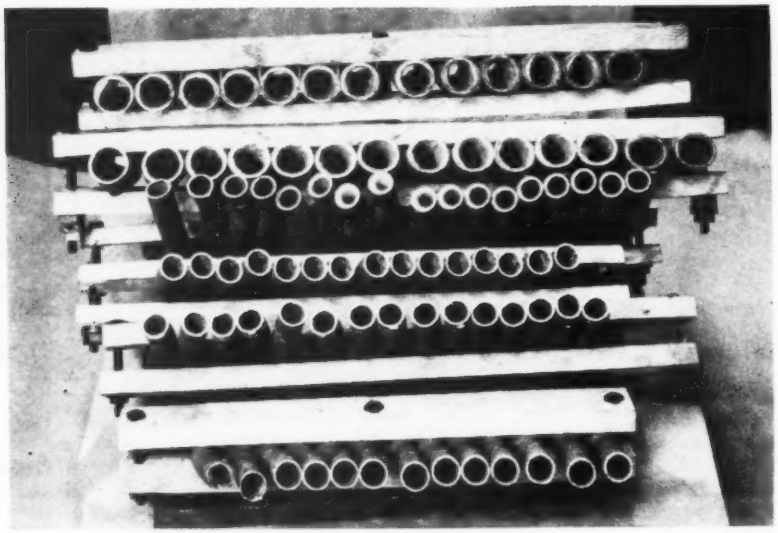
Considerable difficulty is being experienced in maintaining the desired concentrations of corrosion inhibitors at all times. This is particularly true on locomotives which have seen considerable service and which for one reason or another are not maintained in a leak-free condition. The normal cooling-water consumption of a road locomotive that is free from leaks is relatively small, frequently not exceeding five gallons per day.

However, when leaks develop the consumption of cooling water can become so great that most of the corrosion inhibitor is lost in two or three days. This is of prime importance, since, if the alkaline chromate concentration falls below the critical level of approximately four grains per gallon, the rate of corrosion is accelerated beyond that experienced with no treatment. No adverse effects to the cooling systems have been observed from treatment in excess of that recommended, but the cost of treatment is increased due to the increased loss of chemicals when loss of cooling water occurs.

Other Parts Affected

In addition to damaging the cooling system itself inadequate cooling-water treatment also adversely affects the life of other parts of the locomotive engine. The resultant increase in oil temperature due to a fouled cooling system tends to increase the rate of oil break down, to hasten bearing corrosion and to increase the tendency toward sticking piston rings. H. W. Luetkemeyer, chief engineer, Cleveland Graphite Bronze Company, in discussing bearing maintenance in the Journal of the Society of Automotive Engineers, July, 1947, states that "the vehicle engineer cannot solve problems of operators who permit scaling in water jackets, lack of coolant, and other careless maintenance practices."

Since it is known that the alkaline chromate type inhibitors, used in the proper concentrations, are effective in accomplishing the desired results, the actual realization of these results is dependent upon maintaining the necessary analytical control. With a large number of units in service the analytical control must of necessity be exercised by the service forces. A colormetric analytical procedure has been developed for this purpose. It consists of a chemically-impregnated blotter. When one drop of cooling water is placed on the blotter, a definite color develops. The color is then



Failure of a feeder on a locomotive to proportion the treatment accurately caused this set of coils to become severely corroded and heavily scaled

compared with a standard reference chart.

By this method a quite definite evaluation of the amount of chromate present in the cooling system can be quickly determined by the maintenance forces. This test also serves as a permanent record of control since the records of chemical additions may be entered on the spot test card and filed for future reference. It is believed that a simple, quick test of this nature, suitable for use by maintenance forces, is a requisite in any effort to obtain the desired cooling-system conditions.

Steam Generators

Only one type of steam generator for use on Diesel locomotives has been considered by this committee. During the past year a series of tests was conducted which has added considerably to our knowledge concerning the feedwater requirements of these steam generators. These tests are described below.

Demineralized Water.—A two-bed demineralizer was installed by a chemical company at a steam-generator manufacturer's plant for test purposes. The effluent from the demineralizer was post-treated with a proprietary tannin, phosphate, soda-ash boiler compound, and used as feed water for a steam generator. Chicago city water was used as the source of supply for this test. The steam generator was operated for six weeks after which the coils were removed and sectioned. The coils were clean but showed slight corrosion at the inlet end of the outer coil. Several railroads now have demineralizers in service.

Deaeration—A steam-jet deaerator was installed at a steam-generator manufacturer's plant and incorporated in the flow cycle of a steam generator. This deaerator was of such size that it could be installed on a steam generator on most Diesel locomotives. This test indicated that reasonably complete deaeration can be obtained by this type of installation.

Internal Treatment With Calcined Potassium Carbonate—One railroad, operating 25 steam generators for the past year, has been treating all the waters supplied to them with calcined potassium carbonate. The potassium carbonate is added directly to the locomotive supply tanks. This method of feeding was adopted since satisfactory proportioning could not be secured by the feeders on the locomotives.

The water supplies for these steam generators are typical midwestern waters varying in hardness from 6 g.p.g. to 22 g.p.g. and in total dissolved solids from 7 g.p.g. to 32 g.p.g. Sufficient potassium carbonate is added to produce an excess of approximately 30 percent of potassium carbonate in the return water from the steam generator coils.

Reaction Rapid

The reaction between the hardness in the water and the potassium carbonate in the supply tanks is quite rapid, much more so than with sodium carbonate. Samples collected from the locomotive supply tanks 40 minutes after leaving the terminal frequently show as little as ⅓ g.p.g. hardness. The reaction naturally produces sludge but the sludge is relatively nonadherent, whereas sludge from either sodium carbonate or sodium phosphate is adherent at the temperatures encountered in the engine storage tanks and feed-water appurtenances. Potassium carbonate treatment has not resulted in scaling of any of the controls, feed pumps, or supply tanks. The supply tanks are flushed monthly to remove the accumulated sludge. If a small amount of scale should adhere to the supply tanks it can be readily removed by an inhibited acid rinse.

The return water from the steam separator is highly concentrated, frequently having 500 g.p.g. of total dissolved solids, and sometimes as high as 1,550 g.p.g. The usual range of the pH value of the return water is 11.2—12.4. A typical analysis of a return water from the separator with this treatment is as follows:

TDS.....556 g.p.g.....OH 111 g.p.g.
MO.....144 g.p.g.....Hardness O g.p.g.
2P.....255 g.p.g...pH 12.32
MO/TDS 26 per cent

The results to date with this treatment have been good. Steam generator coil washouts have been extended to 30 days and no trouble with high water pressure has been experienced.

Three sets of coils have been removed for examination. The outer coils show some corrosion at the inlet end and very slight corrosion at the outlet end.

Corrosion Control — Tests were conducted to determine if corrosion of the outer coils could be stopped by pH control. These tests indicate corrosion will occur in the presence of oxygen up to a pH of 12.5. This high pH value in feedwater is not economically feasible. However, the higher the pH value of the feedwater the slower the rate of corrosion. Tests with deaerated water with a pH of 7.5 or above showed no corrosion of the coils.

Locomotive Feeders—The various types of chemical feeders on the locomotives for proportioning water treatment compounds to the steam generators continue to be a source of trouble. If water treatment is to accomplish the desired results it must be properly proportioned at all times. Scale formed in the coils due to low treatment cannot be removed by acid washing. Therefore, treatment must be maintained at all times. Another illustration shows a set of coils severely corroded and heavily scaled due to the failure of a feeder on a locomotive to proportion the treatment accurately. The analysis of the scale in the coils is shown in the table.

This scale was practically unaffected by muriatic acid even after 48 hours of contact between the acid and the scale. Note the small percentages of carbonate. The scale probably existed as calcium carbonate, a calcium-alumi-

Analysis of Scale from Clarkson Type Steam Generator Coil

	Fifth Inside Turn of Inner Coil (That is the coil nearest to fire) per cent	Eighth Inner Turn of the Intermediate Coil per cent
SiO_2	4.65	4.47
CaO	32.32	32.72
MgO	12.83	6.54
SO_3	40.25	49.42
R_2O_3	2.25	2.40
CO_2	8.44	6.08
	100.74	101.63

num-silicate complex, calcium sulfate and magnesium sulfate.

This series of tests indicates that a number of types of water treatment can be used with reasonable success. In addition to demineralized water with after treatment for pH control and internal treatment with calcined potassium carbonate, it is believed that lime-soda treatment or zeolite with after treatment for pH control when necessary can in many instances be used successfully. If corrosion is to be completely stopped, oxygen removal from the feedwater must be accomplished. This can be done by deaeration. The exact type of treatment to be selected will have to be governed by the initial type of water available, the volume of water required, the severity of the service requirements and the existing facilities available.

Irrespective of the type of treatment selected, the proportioning equipment used must be accurate and reliable. This indicates the necessity of supplying treated water to the locomotive in a manner similar to that which is employed in the best steam locomotive practice. In addition the analytical control must be sufficiently frequent and accurate to ascertain definitely that proper treatment is being maintained at all times. It is believed this can not be done by the maintenance forces but must be done by a properly trained water engineer.

Heaving Track

(*Continued from page* 406)

peat under the ordinary 0.5-m. thick ballast layer, on the grounds that the resiliency of the peat would result in a low ballast coefficient.*

The answer to this is that upwards of 18 years' experience has failed to reveal any tendency toward an increase in breakage or displacement of rails, or in wear of the superstructure. An undeniable drawback is the increased labor of surfacing in the first years, but this drawback should be eliminated by the use of firmer peat blocks and by avoidance of short replacement stretches.

* The ballast coefficient is the weight required to depress a tie 1 cm.

Draining the Trough

There has been divided opinion on the justification or necessity for draining the bottom of the trough. Cross-drains were formerly used, leading from the bottom of the trough to a longitudinal drain running parallel to the track; or a longitudinal conduit was placed along one side of the bottom of the trough, with an outlet at the end of the excavation. Development seemed to tend toward elimination of drains when the replacement layer is designed for the severest winters and where there is no great inflow of water that may threaten the stability of the line.

To the present time digging of the troughs has been accomplished by hand, and all work, including the filling in of the replacement materials and repair of the rails, has involved breaking the track, preferably at times when traffic was lightest. As soon as conditions permit, pneumatic tools will be generally introduced for digging, and there is a great desire that new methods and special machinery may be developed for this work.

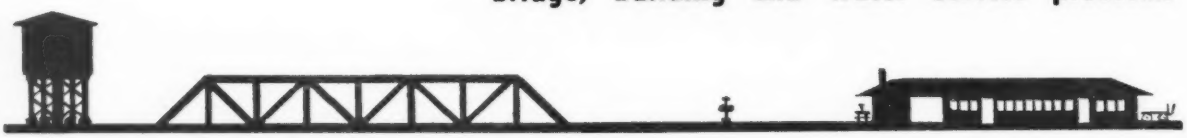
Left—Tractor-Drawn Disker Plowing a Fire Guard on the Northern Pacific. Note Wheel Mounting That Has Been Specially Developed to Serve the Peculiar Requirements of This Type of Equipment. Right—Fire Guard That Has Been Plowed with the Crawler-Disker Combination. Note That, on the Left, a Fire Has Burned Up to the Fire Guard.

Plowing Fire Guards on the Northern Pacific

FIRE guards are necessary on the Northern Pacific throughout most of the states of North Dakota, Montana, Idaho and Washington. Several types of equipment are used for plowing these fire guards, including heavy-duty diskers, especially acquired for the purpose, each of which is drawn by a crawler tractor. The diskers are all double units with each row consisting of six disks 28 in. in diameter. Each disker is mounted on wheels in such a manner that the disks can be raised and lowered mechanically, using power from the tractor, when crossing paved highways or when moving light. With the diskers a fire guard is plowed which is not less than 7 ft. wide. These machines have been found to be most effective in prairie country where there are few obstructions.

WHAT'S THE ANSWER?

An open forum for maintenance men on track, bridge, building and water service problems



Desirability of Crib Cleaning

To what extent is crib cleaning desirable in connection with out-of-facing surfacing? Where the cribs are cleaned, how deep should the cribbing be done? Should the depth be uniform throughout the length of the tie?

Clean to Bottom of Tie

By W. H. SPARKS
General Inspector Track (Retired), Chesapeake & Ohio, Russell, Ky.

Any discussion of the merits of cleaning cribs is worthwhile if it can bring out several present-day needs. One of these is the necessity of doing everything connected with the maintenance of a good surface on tracks in the best way possible. Nothing can be slighted, nothing can be spared, nothing can be too good or done too well. Present heavy traffic requires the best maintenance possible. Another great need today is that of doing everything as economically as possible in order to offset high costs of labor and materials.

On those roads handling a large volume of traffic which includes coal, ore, limestone, sand and gravel, ballast of any type soon becomes fouled from the top to the bottom of ties. When any work is to be done ahead of out-of-face surfacing, it must be done right. That means that this fouled ballast must be cleaned not only at the ends of ties but in the cribs throughout the entire length of the tie. In the cribs the ballast should be cleaned to the bottoms of the ties, and the shoulder ballast to as much as six or eight inches below the bottoms of the ties. This amount of cleaning will furnish drainage from the ballast under and between the ties. If the cribs are cleaned only to the bottoms of the ties there will be less likelihood of the track moving out of line.

Where track is worked through a highway crossing that cannot be raised, the cribs should be first cleaned to as much as 8 to 10 in. below the bottoms of ties. They should then be filled to the bottoms of the ties with new clean ballast. The next step is to move the ties over on the new ballast and remove the old ballast that was under the ties to the same depth as in the first operation and apply new ballast. This leaves the track at the same grade and gives it a foundation of clean, new ballast throughout. It will then remain clean for a longer period of time.

The cost factor in cleaning cribs by hand has made the several available types of new cribbing machines valuable tools for the track forces. They not only save money in labor but save the cost of new stone, slag or gravel ballast in many instances. They also help to give the track the best working it could get. Only by getting the best can it take the beating the present traffic is giving it.

Ballast Determines Extent

By ROADMASTER

To analyze properly the necessity for skeletonizing or cleaning the cribs preparatory to out-of-face surfacing, it appears necessary to give attention to all factors involved, particularly the type of ballast. The extent to which cribs should be cleaned is more or less dependent on the kind of ballast in use and the manner in which the foul ballast can be renovated and restored.

In cleaning ballast careful consideration must be given to the adverse condition accruing when the fines in the ballast are completely removed. This applies not only to a flinty crushed rock, but also to most any other type of good ballast. Experience has taught us that the retention of a certain amount of fines is necessary to remove any "ball bearing" action and to bind the coarse material together. So far as can be determined, this action has in no way adversely affected the ballast drainage.

Certain types of ballast, such as fine chat and chert, volcanic and furnace slag, various types of gravel,

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Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discussed.

To Be Answered In the June Issue

1. *Where large rail-laying operations are involved, is it practicable to organize and equip two separate gangs, the second to relay the opposite rail a mile or so behind the first gang? What are the advantages and disadvantages of such a set-up?*
2. *To what extent is structural aluminum adaptable for use in railway buildings? What are its special advantages? Its limitations?*
3. *Under what conditions, if any, should ties be renewed before new rail is laid? What are the advantages? The disadvantages?*
4. *What are the effective methods of obtaining a uniform bearing for bridge shoes on new or worn bridge seats?*
5. *Has the increased use of Diesel locomotives had any effect on the maintenance of curves? If so, in what ways? Explain.*
6. *Where highway motor trucks are used by water service repair crews, what type and capacity of truck is best adapted? Should it be specially equipped in any way? How?*
7. *What are the desirable characteristics of tie plate bottoms to assist in holding track gage and minimize mechanical destruction of the ties? What design do you consider best? Why?*
8. *What are the advantages or disadvantages in applying primers having decay-resistant qualities before painting wooden signs, posts or wooden parts of work-equipment? Explain.*

etc., cannot be economically renovated by cleaning. Since this type of ballast in certain localities becomes exceedingly foul after only a few years of service, there is little alternative but to crib out the old ballast and replace it. To add a veneer of clean ballast to the foul already in place only shortens the life of the new ballast and does little to improve the troublesome situation. To mix a hard ballast with soft, or vice versa, is a serious mistake and accelerates deterioration.

Cost prohibits the wasting of ballast if it can be restored to further service economically. On the other hand, it is false economy to pay more for such cleaning and restoration than new ballast will cost in place. Present labor rates make the cleaning of ballast by hand methods prohibitive. Some equipment is now in use and additional devices are being perfected that will permit the cleaning of cribs at a comparatively low cost and will allow the wasting of foul ballast on the shoulders before the new ballast is dropped.

Under certain conditions an excessive ballast section is just as objectionable as an insufficient one. The proper balance may be obtained by raising the track shoulder an amount corresponding to the height the track is raised. Raising the shoulder with the foul ballast will not only avoid a follow-up shoulder restoration charge by the usual side-borrow method, but will also avoid the possible boxing-in of the toe of the ballast section with impervious material, creating water pockets and soft spots.

As to the depth of such cribbing, it is the usual practice to go only to the bottoms of the ties. However, the amount the track is raised should govern the depth of cribbing. For example, in an extensive cribbing and out-of-face program, where a new type of ballast was introduced, the old ballast was cribbed out and used to restore the shoulder. The profile of the new grade line was carefully examined and the cribbing was carried below the ties at locations of small raises to provide the minimum of six inches of clean ballast below the ties. At locations where the raise was in excess of six inches, the amount of cribbing was decreased correspondingly.

Care in Use of Grinding Wheels

What precautions should be observed in the care and use of slotting and grinding wheels in track work to prolong their life, increase their effectiveness and reduce the hazard of accident? Explain.

Many Precautions Required

By C. L. Fero
Supervisor Work Equipment, Boston & Maine, East Cambridge, Mass.

In the care and use of abrasive wheels there are many precautions which should be taken, chief of which is the proper operation of grinding machines. Operators of such machines should be provided with a tachometer with which to check frequently the speeds of the grinder spindle to be sure that it is in accordance with the speed specified by the grinding-wheel manufacturer, and especially to insure against overspeed, which is dangerous.

The efficiency of a grinding wheel is predicated on the correct speed in surface feet per minute, the proper grade and grit of abrasive for the metal to be ground, and the right diameter, width and shape of the wheel.

Machines should be free from vibration, bearings kept tight, and excessive feed or pressure against the wheel avoided. Great care should be used in mounting wheels to see that the flanges and collars are free from dirt, and that they fit snugly against both sides of the wheel. Only recessed collars or flanges of the right diameter and thickness for any particular wheel should be used as the use of ordinary flat washers is dangerous.

For maximum safety, wheels on any grinding machine must be adequately guarded to prevent accident in case of wheel breakage.

Observe Certain Rules

By W. D. Hoffman
Sales Engineer, Railway Track-Work Company, Philadelphia, Pa.

There are five general rules which should be observed to obtain the best performance from slotting and grinding wheels.

(1) Be sure the guide is fastened securely to the rail and in perfect alinement with the rail ends.

(2) Operate the wheel at the speed recommended by its manufacturer.

(3) Do not force the wheel into the work. In this connection, be sure to observe extra care when slotting open joints to remove normal overflow metal or that added during welding operations.

(4) Exercise caution when handling wheels to prevent their fracture before they are put in service.

(5) Instruct operators to follow the instruction of the manufacturer, who is fully informed on the Standard Safety Code for the Use and Care of Grinding Wheels.

Must Maintain Right Speed

By E. T. Larson
Sales Engineer, Abrasive Division, Norton Company, Worcester, Mass.

The principal factors affecting the life-performance and safety of abrasive wheels used for track grinding are mounting, guarding, maintenance of proper wheel speed, handling and storage.

Some of the most common errors in mounting which may cause grinding wheels to break are: (1) Forcing a wheel onto an arbor where the fit is tight; (2) failure to clean all dirt and foreign material from the sides of wheels and flanges; (3) substituting a washer for the regular loose flange supplied with the machine; and (4) tightening the spindle nut excessively so as to cause the flanges to bend.

There is a tendency for operators of portable grinding machines, such as those that are used for grinding track welds, to remove the guard or protection hood because they think it is in the way. The guard has been provided to protect the operator in case the wheel should accidentally break. Under no circumstances should he remove it.

The abrasive wheels most generally used for grinding and slotting track welds are of three bond types, namely, vitrified, resinoid and rubber. The vitrified bonded wheels can be safely used at speeds up to 6,500 surface ft. per min.; resinoid and rubber at 9,500 surface ft. per min. For most effective cutting action and wheel life, wheels should be operated as closely to these maximum peripheral speeds as possible. However, it is equally important that these speeds are not exceeded. Both gasoline-engine and electric-motor-driven wheels should have the idle speed carefully checked from time to time and particularly after they have been repaired, to be sure the wheels are not overspeeded.

Occasionally the power supplied by a portable generator is insufficient to operate all of the grinders and slotters on the line up to their full speed under load. When the wheels are running at reduced speeds, they cut slower, wear faster, and the thin slotting wheels are apt to break easily in the cut when the operator forces them.

It is important that grinding wheels

be stored and handled carefully. They are not all of the same strength. Some are quite brittle, others are tough. The bond in vitrified wheels is similar to glass and can be broken easily. Careless handling can easily damage such wheels. Resinoid and rubber-bonded wheels, such as those used for smoothing welds, can usually stand more abuse. On the other hand, thin slotting wheels can be broken very easily.

Grinding wheels used for track grinding often are stored in unheated places during the cold winter months. If a cold wheel is applied abruptly against a rail, the marked temperature differential might cause the wheel to break. A cold wheel should be applied gradually to the rail, giving the wheel a chance to warm. This rule applies equally to wheels that have been left on the machines overnight in cold weather.

Function of Open-Deck Anchorage

What is the best method of fastening the track structure to the steelwork of open-deck bridges? What is the purpose of such fastening? Explain.

Holds Deck in Line

By A. E. Bechtelheimer
Bridge Engineer (Retired), Chicago & North Western, Chicago

The first question implies there is necessity for fastening bridge ties to the supporting steelwork of open-deck bridges. The second question is more specific and is the key to the subject. Any fastening in connection with the track structure must possess a major degree of rigidity and tightness. Where the track rails are fastened directly to steelwork there is very little, if any, differential movement between the rails and the supporting steel. The condition is vastly different where bridge ties are installed between the track rails and the steelwork, since there exists greater freedom of movement for the rail. Also, there is deflection and differential movement of the ties which, with the dissimilarity of the materials, prevent the attainment of any positive degree of rigidity and tightness of fastenings.

Since the beginning of open-deck construction, it has been the general practice to space the ties by the use of outside timber guards which either were dapped over the ties or were made effective as spacers by some other means. Two principal procedures were used to hold the track to line: (1) Dap or gain all the ties over the steelwork; or (2) install two hook bolts in every fourth or fifth tie. These procedures served very well for many years. However, the effects of heavy-weight, high-speed traffic, the general use of treated timber and the increasing costs of timber and framing, highlighted by the ineffectiveness of the old-style hook bolt, finally put a spot light on the deck-anchorage problem. Efforts looking to the solution of this problem have led to the development of a number of proprietary devices, including an improved design of the hook bolt. In addition, some roads have developed their own devices, all of which appear to adhere to the idea that the device must perform a dual function of holding the deck to line, and of forestalling vertical movement of the deck. The periodic tightening of these fastenings, in an endeavor to accomplish this dual function, results in detormation of the device or damage to the wood adjacent to it, either of which eventually renders the device ineffective for performing acceptably either of the functions.

I believe it is unnecessary and impracticable to provide a dual purpose fastening. Hence, my answer to the second question is, "to hold the deck to line on the steelwork" and, if there is agreement on this, then the method of fastening can take ony one of several forms so long as it functions substantially in the same manner as the dapped tie functions. The device must make contact with the edge of the supporting member only, and it must be clear of the under side of such supporting member to allow for the maximum vertical movement. This implies a vertically projecting obstruction extending below the bottom of the tie, and where there exists a possibility of the deck being floated out of position by high water, a hooked obstruction may be required, but, if so, the shank must be so formed as to hold the hook clear of the steelwork.

Diesel's Effect on Water Service

In what fundamental ways is the trend toward Dieselization on the railroads affecting water service organizations, existing plants and plans for new facilities? Explain.

Changes Not Desirable Now

By B. W. DeGeer
Engineer Water Service, Great Northern, St. Paul, Minn.

As long as both steam and Diesel power is kept in operation on the same district, little change in water service organization is desirable. Most of the old water facilities must be kept in service in addition to a few new ones required to furnish water for Diesel power. In some cases these new facilities are rather elaborate. When a district is completely Dieselized, some reduction in water-service operating and maintenance forces may be possible, as fewer watering points will be required; but I do not believe any reduction in the force which controls the quality of the water will be found practical. Such water as is furnished must be kept in as near perfect condition as is possible; and as the number of Diesel units in service increases, there is a great increase in the number of water samples to be tested.

On many railroads water samples from steam locomotive boilers are tested every day. This makes one test per locomotive per day. On freight Diesels there are usually four radiator samples to be tested every day, and on large passenger units there are three radiator samples and three steam generator samples to be analyzed. This amount of testing makes quite a lot of extra work, but experience has shown that it is desirable, if correct water conditions are to be maintained.

Existing water facilities, with some refinements in treating units, are often used to supply water for steam generators. But if the equivalent of distilled water can be procured at reasonable cost, it seems desirable to furnish it for use in Diesel locomotive radiators. To prevent corrosion it is necessary, even then, to add chemicals.

When existing facilities wear out, they will no doubt be replaced with fewer, smaller units, with up-to-date equipment for conditioning the water, if no steam power is in service at that time. But if improvement in steam power continues, and both steam and Diesel units are continued in service, new water facilities to accommodate both types of power will be necessary.

No one, at present, can foresee the long-time effect of the steam turbine and other newer types of steam loco-

motives, the coal and oil-burning gas-turbine locomotive, and the availability and cost of Diesel fuel oil, etc., on the present trend toward Dieselization. In the meantime there seems to be a disposition to get along with present water facilities, so far as is consistent with good Diesel operation, while awaiting future developments.

Diesel Requisites Greater

By G. E. Martin
Superintendent Water Service, Illinois Central, Chicago

The Diesel is replacing the steam locomotive almost 100 per cent on a small number of railroads, but has been confined in most other cases, to passenger and switching services, with a comparatively small use in freight service. The quantity of water required to operate a Diesel locomotive is small compared with the amount needed for a steam locomotive. It is generally accepted, however, that greater care and attention is required to make the available water suitable for use in Diesels as a cooling water, or for the steam generators on the passenger trains, than is required to produce suitable water for steam locomotives.

Except for possibly the few railroads that are 100 per cent Dieselized, the use of Diesels does not appear to have any definite effect on the water service organizations or the number of water stations necessary for steam locomotives, as it is necessary to keep approximately all water stations for the remaining steam locomotives and to maintain additional facilities for the Diesels. Railroads making extensive use of Diesels are constructing many new watering facilities, fuel stations and oil-storage plants. These facilities are generally installed and maintained by the water service organization on each division and, on certain railroads, the engineering for all of them is handled by the water engineer.

It would seem that railroads using Diesels entirely for power could retire the water stations formerly used for the steam locomotives and eliminate pumping and maintenance expense for these stations. However, if it is necessary to keep them for standby service for the steam locomotives, there is not much saving effected. Modern pumping stations and those with city water supply do not require attendants. The maintenance on a water station kept in service by an occasional steam locomotive is approximately the same as that for a station used regularly for that purpose. The cost of water per 1,000 gal. delivered to the locomotive increases as the quantity decreases. The cost of water purchased, and the cost of treatment or power for pumping are the only ones that vary with the quantity consumed.

The problems that are constantly developing from the quality of water used for cooling the Diesel engine and for the steam generator are many. Controlling treatment for these purposes will require about the same organization as was formerly required for the steam locomotive.

In planning for new water facilities on railroads using some Diesels it would seem advisable to provide adequate facilities at points needed to supply water for the steam generators on passenger trains but continue to use existing facilities for steam-powered trains in passenger service. The providing of modern and adequate facilities for steam locomotives in freight service should be continued.

When the situation is summed up, it appears that the additional water and fuel facilities, and the better quality water required for Diesels, plus the necessity for maintaining steam locomotive facilities in many instances, will require plants and a water service organization equal to or larger than for steam locomotives alone.

Minimizing Dusty Tracks in Town

Can the annoyance to adjacent property owners, where high-speed passenger trains have a tendency to kick up a large amount of dust when passing through towns, be minimized or prevented? How?

Oil Is a Help But No Cure

By A. G. Reese
District Maintenance Engineer, Chicago, Burlington & Quincy, Galesburg, Ill.

Any program to eliminate entirely the clouds of dust which may follow high-speed trains through towns would be very expensive since it would involve a continuous operation. On a railroad transporting a heavy tonnage of coal, this is particularly true, since slack or crushed coal for modern power plants is transported in open-top, hopper-type cars, and dust from these cars is continually settling to the roadbed. There it rests, ready for another dust storm to be stirred up by following high-speed trains. Dust blown in from adjacent property and parallel streets and highways also contributes a considerable portion of the material involved in these dust storms.

To eliminate entirely this annoying condition would involve the prevention of any foreign material settling on the roadbed. This would require the transportation of dusty commodities in closed cars and the elimination of dust from adjacent property, highways and city streets. Railroad tracks would also have to be resurfaced and the ballast cleaned at frequent intervals. While it is possible to realize this ideal condition, it is impracticable as the expense would be enormous.

Some relief has been secured by oiling the right-of-way, but this is temporary since additional dusty material is being deposited constantly. Too-frequent oiling is not recommended because it tends to seal the ballast section and impede drainage. This results in puddled tracks, further aggravating the condition to be corrected.

Since it is impractical to eliminate entirely the annoyance of dust storms created by high-speed trains, we can endeavor only to minimize the condition to the best of our ability by maintaining as clean a ballast section as possible and spraying the roadbed with oil when conditions dictate.

Can't Be Prevented Always

By G. M. O'Rourke
Assistant Engineer Maintenance of Way, Illinois Central, Chicago

At certain times of the year it is impossible to prevent annoyance to adjacent property owners where high-speed passenger trains have a tendency to kick up a large amount of dust as they pass through towns. The annoyance can be minimized, however, by selection of ballast and by spraying the ballast section with oil.

Clean Ballast Best Answer

By General Roadmaster

The dust problem is not new; it is only different. For many years maintenance officers have been besieged by passenger traffic representatives to "do something" about the dirt, dust and smoke that poured into the open windows of coaches during the summer. The situation was aggravated by the fact that many of the lines on which the problem was gravest were of the light-traffic variety. They carried little winter business, but were

traveled heavily in the summer by vacationers. Being branch lines they seldom warranted stone or slag ballast. Hence their dust or dirt problem originated from the dry, light and loose character of their substitute ballast, and not from any material dropped from freight cars.

The cheapest and most effective solution of this problem, which often existed for miles, was an application of waste oil saved at shops, enginehouses, etc. Tank cars, especially assigned to this duty, were loaded during the winter and their contents spread over the ballast section from one end of the offending territory to the other prior to the vacation season. One application per year usually sufficed, except at those locations where the track was being worked and the oil disturbed. These spots were not continuous and no serious problems resulted.

With the advent of air-conditioned equipment the dust problem was solved as far as the passenger was concerned and the annoyance was concentrated on the inhabitants of the local towns through which the railroad passed. There, the problem still exists and is attacked in proportion to the amount of agitation against it that is aroused by the public.

It has three basic solutions, each with merits, and each with the common disadvantage of relatively high cost, at least in comparison to doing nothing about it. Probably the best solution is to install stone or slag ballast and to keep it clean by cribbing and cleaning. New machines in service are being developed which make this possible. Furthermore, a better railroad results and lower maintenance costs offset the higher cost of the ballast, as compared to the old, and its application.

The other two methods of attacking the problem are similar. One is to spray the affected area with oil, while the other is to spray it with a deliquescent salt, such as calcium chloride. The first is cheaper, if waste oil is available. The latter is cleaner and presents a better appearance, but may not remain effective as long as an oil treatment.

Classification-Yard Maintenance

How can a yard foreman best maintain true grades and good surface on hump and other important tracks in classification yards? What effect have heavy rail and good ballast? Can permanent grade stakes be placed? How?

Yards Need Best Materials

By A. B. Hillman
Engineer Maintenance of Way, Chicago & Western Indiana, Chicago

The correct grade for use over a hump, through the retarders and into classification yards has been determined after considerable study of actual operating conditions on yards throughout the country. The successful operation of the yard depends largely upon maintaining tracks to these grades.

Between the peak of the hump and the entrance to the classification tracks, there are a number of sharp breaks in the grade. No matter how skilled a foreman may be, it is extremely difficult to surface track and maintain the proper grades without the use of grade stakes. The placing of stakes insures the maintenance of the true grades and enables the foreman to do a satisfactory job in the short time operating conditions generally allow.

Permanent grade stakes provide a positive check of grades at all times. Such stakes, however, should not be placed in a manner that will create a hazard to trainmen and others working in the yard. Satisfactory grade monuments can be placed at approximately ground level and at a uniform distance below the top of the rail.

It is extremely difficult to maintain good line and surface with light materials and poor ballast on any track. To attempt to maintain true grades in a hump yard under these conditions results in an excessively heavy labor charge and many delays to operation.

The greater initial cost of installing heavier rail and good ballast is offset, to a large degree, by resultant lower maintenance expense. In addition to this, the reduction in the time that tracks are taken out of service by maintenance forces decreases the cost of yard operation and permits a smoother and more uniform movement of cars.

Heavier material and good ballast also decrease the possibility of derailments from track conditions. When derailments do occur, the resulting damage to track is generally much less than it is with tracks of lighter construction, thus permitting service to be resumed sooner at less cost.

Everything possible should be done to improve track conditions in hump yards not only to decrease labor requirements for maintenance, but also to increase the operating efficiency.

Good Rail Saves Money

By W. H. Sparks
General Inspector Track (Retired), Chesapeake & Ohio, Russell, Ky.

The maintenance of classification yards cannot be handled the same at all locations. On most humps, fixed structures and track units, such as scales, crossing frogs, crossovers between leads, or car retarders limit the amount of surfacing that can be done. These units fix the grades of the tracks and permit only small variations from them.

This places a responsibility on the yard foreman of maintaining line and surface between these fixed points as true as possible. He must also see that the grade is true beyond these units, for any break in grade disturbs the freedom that is essential to uniform operation, especially where car retarders are in use. Grade and line stakes might help to maintain the grades of tracks leading to classification yards, but a yard foreman should be able to do this necessary surfacing and lining without stakes. On the other hand, tracks leading away from switches should have both line and grade stakes.

Over humps, and on other important tracks and ladders, the rail should be the best and heaviest obtainable. Such rail will help to hold line and surface; will lengthen the life of ties and switch timber, thereby preserving good gage; and will reduce maintenance of other parts of the track structure.

The full effectiveness of good rail can only be realized by its being supported on good, clean ballast. Just what type of ballast to use on humps, ladders and leads for the most benefits is a question needing considerable study, and may vary under different circumstances. On many railroads where the cars being classified contain loose, dirty commodities, like coal, coke, iron ore, stone and gravel, any ballast will get dirty and require frequent cleaning or renewal. Renewal means that the old material must be cribbed out, piled and later hauled away. This is an expensive operation in any yard, but especially so in a large, busy one.

Some officers believe that stone ballast is best at some locations. However, to remove it when it is dirty costs more than it does to dispose of gravel ballast. In such circumstances, I question whether the advantages that stone ballast has over gravel warrant its higher first cost and the expense of its later renewal. In those yards where the majority of the loads classified contain cleaner material there are few arguments against the benefits of stone ballast.

Fires at Fuel Oil Facilities

How should facilities for handling and storing Diesel fuel oil be protected against fire? Explain.

Use Welded Pipe

By W. S. Wicker
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Facilities for storing and handling Diesel fuel oil range from large storage tanks of 100,000 gal. or more in capacity down through the smaller supply tanks to the portable tank-truck facilities used by some railroads in fueling Diesel switchers and similar equipment. There are fire hazards in varying degree in connection with the handling of Diesel fuel oil from the time it is received on the unloading track until it is delivered into the tanks of locomotives.

When Diesel fuel-oil unloading facilities are installed in accordance with good practice, which includes overhead or dome unloading devices, and in some cases the bonding and grounding of tracks, the fire hazards are minimized. The usual precautions to take are those against smoking and open flames or torches. It would be desirable to post signs at such facilities reading:

FLAMMABLE LIQUID
Keep Open Lights and Fires Away
NO SMOKING

Fire protection for such facilities should consist of a conveniently located 20-lb. carbon-dioxide extinguisher, or an equivalent size of an approved dry-powder type for the smaller installations, and additional protection where the installations are large enough to justify it.

A few construction and installation features have a direct bearing on the hazard of fire. A fuel-oil pump house should be of fire-resistive construction and be provided with explosion-proof electrical installations. Care should be taken to see that a check valve is installed in the pipe between the unloading rack and the first valve at the pump, and another check valve installed between the filter, or the equalizing pressure tank, and the storage facilities. These valves are necessary to prevent a back-flow of oil through the pumps in case the manually-operated valves are accidently left open.

In some cases gasoline-driven stand-by motors are provided for service in case of power failure and the resultant immobility of the electric-driven, fuel-oil pumps. Where such gasoline motors are provided, they should be installed in a separate room cut off from the fuel-oil pump house proper by a fire wall. The shaft from the gasoline engine to the fuel-oil pump, which of necessity must run through the fire wall, should be equipped with a stuffing box.

The fire protection for Diesel fuel-oil pump houses should consist of carbon dioxide or approved dry powder extinguishers of 20-lb. capacity or larger. The open-flame or No-Smoking sign mentioned above should be placed at all fuel-oil pumping facilities.

In some cases Diesel fuel-oil supply tanks are buried, but the trend now is to install such tanks above ground on concrete piers to facilitate inspection and to detect quickly any leaks that may develop. Such supply tanks of 15,000-gal. or less capacity need not be diked at single tank installations, but, where two or more such tanks are placed adjacent, adequate dikes should be provided. The portable extinguishers at the pump house are usually depended upon for protection against incipient fires at the supply tanks.

Diesel fuel-oil storage tanks of 100,000 gal. or larger capacity should be installed where they will not expose other property, and should be diked separately. A drain pipe having a valve should be placed in the dike so that any water accumulations in the enclosed space may be easily drained.

An automatic built-in foam-generating system should be installed as fire protection at each Diesel fuel-oil storage tank of 100,000 gal. or more capacity. When such tanks or other facilities are located where yard hydrants are available at which pressures above 45 lb. at the nozzle can be secured, each hose house should be equipped with an approved fog nozzle.

Diesel fuel-oil piping should be welded at all connections possible. The trend is to install such pipes on permanent non-combustible supports above ground so that in case any leak develops it can be quickly detected. In some of the earlier piping installations screw joints were used, and in a few cases serious leaks developed even though the joints were coated with a mixture of Venice turpentine, litharge and shellac, or a mixture of litharge and glycerine. It has been found generally that Diesel fuel oil will seep through any connection except a welded joint.

Servicing facilities for supplying Diesel locomotives with fuel oil at terminals and shop yards formerly consisted of valves located in a shallow trough at ground level. The servicing hose was stored in the trough when not in use. Such installations quickly became filled with dirt and leaking oil and generally proved unsatisfactory. The newer installations consist of oil columns of sufficient height that the hose, when hanging free, will clear the ground. Each hose is equipped with a spring valve at the discharge end. Manually-operated valves are usually installed in the columns. Diesel-locomotive fueling facilities should not be installed inside shop buildings.

Conspicuous no-smoking signs of the usual type should be posted at such facilities. Several 20-lb. carbon-dioxide or approved dry-powder extinguishers should be kept available for first-aid fire protection. Fog nozzles should be provided at hydrants where adequate water pressures are available.

Where tank trucks are used or where portable tanks are provided for fueling facilities, carbon-dioxide or approved dry-powder extinguishers of at least 20-lb. capacity should be provided.

Water Fog Is Effective

By Floyd J. Lee
Sales Manager, Fog Nozzle International Incorporated, Los Angeles, Cal.

Diesel fuel oil has a flash point varying from 165 to 175 deg. F. This is far above the normal temperature of water. In fact, the difference in heat range between that necessary for Diesel fuel to give off vapors sufficient to maintain combustion and the normal temperature of water is about 100 deg. F. It is within this range of temperature that extinguishing agents have to work.

Foam, carbon dioxide, carbon tetrachloride, and dry powder extinguishers are effective against Diesel fuel oil fires where an instant application or small involvement is desired. Foam is also suitable for protection of large storage tanks.

However, water fog or a combination of water fog and mechanical foam provides the most ideal protection for Diesel fuel oil at the present time. Water fog has the greatest heat absorption and cooling effect of any fire extinguishing medium now in common use. This permits an operator to approach a fire without undue physical discomfort or danger of being burned. Heat transmission seems to be eliminated through a water-fog curtain. Furthermore, it forms a slight emulsion on the surface of the oil and dilutes the vapor.

Fuel handling facilities in enclosed areas and storage tanks can now be

effectively protected by automatic means. New, automatic fog heads can be installed on fixed piping within the pump houses and oil-handling facilities. These heads fuse and produce a uniform, fine water spray over any predetermined area when the temperature reaches 165 deg. Other link settings at higher ratings can also be obtained. The satisfaction that the fire watch is on constant duty is also self-assuring. Alarm gongs can be installed on these systems to indicate immediately if any head has opened. If a more extensive system is desired, or if it is necessary to protect buildings that are not heated, electrically-operated devices can also be installed. These devices will detect a rapid rise in temperature, and will close the circuit to open valves remotely located. The availability of such controls permits a dry piping system to be installed in unheated locations. With this type of system all heads on any one valve will be operated simultaneously.

Probably the most recent development in Diesel fuel-oil storage-tank protection is the automatic fog and fog-foam combination. Hydraulic arms are moved out over the tank when the temperature reaches a predetermined figure. At the outer end of the arm a rotary fog nozzle is attached which will deliver 200-g.p.m. for a 40-ft. diameter coverage. The valve mechanism and water-flow control is located below frost line in a closed galvanized case. Full provision for drainage is provided. For tanks more than 40-ft. in diameter a manually-operated foam system is usually added. In this system, water fog first cools the material and then mechanical foam is used through the same nozzles that were utilized for dispensing the fog. Although foam is provided as an extra precaution, in the majority of cases, a fire would be extinguished entirely by the fog nozzles. An ingenious nozzle developed for this dual purpose makes the system very efficient.

Cleaning Asphalt Tile Floors

What are the best methods of cleaning asphalt tile floors? How can the luster be maintained with minimum hazard of slipping?

Use Only Neutral Soaps

By R. W. Harding
Building Products Division, Johns-Manville Sales Corporation, New York

When any of our asphalt tile flooring is installed by an approved contractor, he gives the individual in charge of maintenance a copy of our "Maintenance Instructions." The information contained in this literature is based on years of experience and, if closely followed, will safeguard the beauty and insure long and satisfactory service of the flooring. These instructions are also approved by the Asphalt Tile Institute, and are abstracted below.

Do not attempt wet mopping, washing or waxing until the asphalt tiles are thoroughly bonded to the subfloor. If water or wax should get under the tile before they are bonded, the cement bond will be destroyed. This will result in unnecessary expense for replacement due to breakage. Therefore, the floor should not be washed for at least two weeks after it has been installed. Daily sweeping with a soft broom is all that is recommended during this period.

For cleaning asphalt tile, use only neutral soaps approved by the manufacturer. Systematic damp moppings with clean water and an occasional washing with a dilute solution of a good neutral soap and lukewarm water will keep the floor clean and attractive. Strong soaps and alkaline or abrasive cleaners are so harsh that they not only dull the luster but will eventually disintegrate the tile. Soap powders which contain fillers not readily soluble in water leave a white sediment between the asphalt tile units, and should never be used.

The surface of the asphalt tile should be thoroughly mopped until all dirt and wax is loosened. Care should be taken to avoid flooding the floor surface. After washing remove all traces of soap from the surface, using a clean mop frequently rinsed in clear, warm water. Allow the floor to dry thoroughly before applying a coat of any of the approved, water-emulsion waxes. Never use sweeping compounds that contain free fats, oils, sand or chemicals.

After the floor has been thoroughly cleaned, apply a coat of an approved water-emulsion wax in accordance with the manufacturer's directions. This type of wax will produce a pleasing luster, and may be brought to a high gloss by the use of a power polisher. The frequency of waxing depends entirely on the amount of traffic to which the flooring is subjected. Never use waxes that contain turpentine, benzine or similar solvents on asphalt tile.

Ordinarily, most asphalt tile, maintained as described, can be kept in the best condition by dusting daily with a dry mop between cleanings. Areas subject to heavy traffic should be cleaned and polished regularly.

Do not use varnishes, lacquers, shellac or other plastic finishes on asphalt tile. These materials usually contain solvents that will injure permanently the asphalt tile, eventually yellow the surface, and, where subjected to constant use, wear off in traffic lanes. Strong alkalies or solvents which injure the tile must not be used.

If ordinary washing fails to remove any stains, the surface of the tile should be rubbed lightly with No. 00 steel wool, using a concentrated solution of neutral soap or cleaner and warm water. Grease and oils allowed to remain in contact with asphalt tile will permanently stain the floor. In case of the spillage of grease and oil, wipe off immediately.

Asphalt tile rates high from a safety standpoint. The National Bureau of Standards tests show that a person is less likely to slip on this material than on any of the other smooth-surfaced, resilient floorings, provided a heavy coat of wax is avoided.

Applies Approved Plastic

By L. C. Winkelhaus
Architectural Engineer, Chicago & North Western, Chicago

When asphalt tiles are first laid, they should receive an application of liquid floor wax in order to prevent surface dirt from being ground into the face of the flooring material. In certain instances, this waxing is objectionable on account of the hazard of slipping.

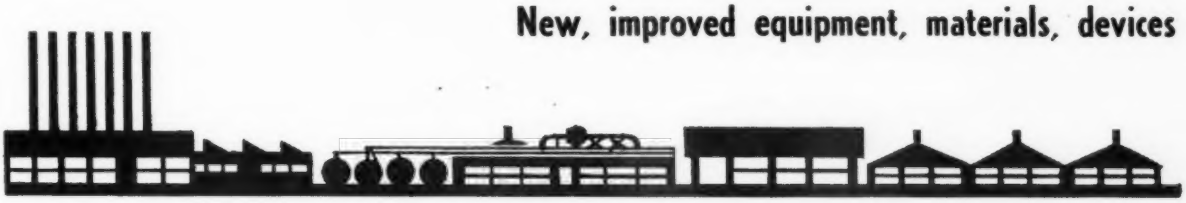
This slipping hazard can be greatly reduced by applying a plastic compound which is colorless and non-skid, and which will preserve the luster of the flooring. The material can be applied at any reasonable temperature and will dry to touch within an hour and enough for traffic in eight hours.

Before applying a finish coating to an existing installation, care should be taken to remove all wax, grease, oils, and other foreign material from the surface to be finished. This may be accomplished by scrubbing the floor with a mixture made by dissolving one cupful of trisodium phosphate per gallon of water and then rinsing with clear water.

Such a plastic finish can be applied by the ordinary janitor service with a soft rag. The finish can be mopped as often as necessary with warm water containing a mild soap solution.

PRODUCTS OF MANUFACTURERS

New, improved equipment, materials, devices



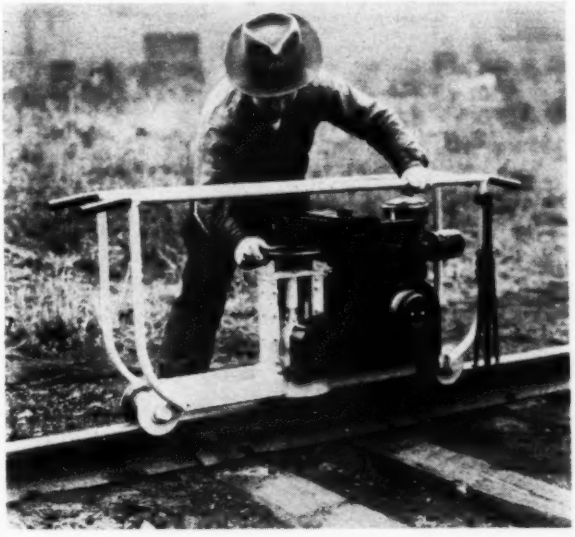
(For additional information on any of the products described in these columns, use postcards, page 433)

Rail Grinder

THE Railway Track-Work Company, Philadelphia, Pa., is now offering a new portable one-man cup-wheel grinder for grinding welded rail ends and for removing mill tolerance and mill scale ahead of the heat treating of rail ends. This grinder is said to be modern in design for durability and greater accuracy with minimum skill and effort. Known as Model P-45, it is said to be especially adapted for use in locations of heavy traffic because of its portability.

Essentially the new machine consists of a cup-wheel grinder driven by a 3½-hp., air-cooled gasoline engine through a V-belt drive, all being mounted in a carriage which is moved along the rail on two rollers. The adjustable V-belt drive acts as an overload release, preventing damage to other moving parts. Ball bearings are used throughout and wearing points are protected from dust and dirt.

Accurate adjustment of the cup-wheel grinder is secured through a screw in a vertical guide slide frame which is equipped with bronze gibs and means for adjustment to compensate for wear. The rollers on the carriage are adjustable to assure a proper cutting angle of the grinding wheel. The machine is 58 in. long, 25½ in. high and weighs 225 lb.



The Model P-45 portable surface rail grinder

Spring Washer

A NEW addition to its widely diversified line of Hy-Crome Spring Washers for use in the railroad field has been announced by the Eaton Manufacturing Company, Reliance Division, Massillon, Ohio. Known as the Xtra-Hy Hy-Crome Spring Washer, the new product has been developed to meet a specific need.

Due to substantial increases in train speeds and wheel loads, many railroads have found it necessary in recent years to use track devices designed to give service in excess of that formerly required, and spring washers used on track bolts have been no exception in this regard. A new tentative specification for track-bolt spring washers, calling for greater physical values, was recently approved by a subcommittee of the Committee on Rail of the American Railway Engineering Association.

Experiments were conducted by the Reliance Division of the Eaton Manufacturing Company to develop a product that would not only conform to the requirements of the tentative specification, but which would accomplish this without the necessity for increasing the bolt length over that which the railroads are now using. Another objective was to provide in the new device a spring washer which would properly fit the angle bar. The Xtra-Hy Hy-Chrome Washer is designed to satisfy these various requirements.

Reliance Xtra-Hy Hy-Crome spring washer

Chemical for Brush Control

THE Chipman Chemical Company, Inc., Bound Brook, N. J., is introducing into the railroad field its 2,4-D Ester 44%, a chemical specifically designed to kill or control the growth of woody shrubs on rights of way, under bridges and around pole lines. This product, it is said, will not harm most types of grasses which it is usually desired to retain. It is a liquid containing 44 per cent of the isopropyl ester of 2,4-dichlorophenoxyacetic acid (equal to 3.34 lb. of 2,4-D acid per gallon).

For one treatment covering a strip 20 ft. wide, the cost of the chemical is said to be $10 to $15 per mile, with the exact cost of application depending on the method of spraying, the extent of the territory covered and the character of the terrain. For normal application the manufacturer recom-

mends using 3 pints of the chemical per 100 gal. of water. To wet the foliage thoroughly on one acre, 200 gal. of the solution would normally be required.

Chipman 2,4-D Ester can be applied with various types of spray equipment ranging from a small knapsack sprayer to a large power spraying unit. Using this product many species of brush and woody plants can be defoliated by spraying the leaves. If brush and trees have reached considerable height (over 8 to 10 ft.) the manufacturer recommends that the area be cut over prior to chemical treatment, and regrowth of sprouts to a height of 12 to 18 in. be permitted before application of the chemical. Although cutting may be necessary before the first treatment, the ultimate savings effected in brush control programs is said to be high. The greatest advantage claimed for the use of this product lies in the progressive elimination of the troublesome and persistent regrowth. Although most plants are readily defoliated, several applications are usually required to kill all woody growths and roots. According to the manufacturer the ideal time of treatment is when plants are vigorous and approaching full leaf development.

Since 2,4-D Ester is injurious to many crops, such as cotton, tomatoes and broad-leafed plants generally, including flowers and ornamental plants, care must be taken to prevent spray from drifting onto sensitive plants in adjoining areas. For this reason high pressure sprayers are not recommended. This product is generally considered to be non-poisonous to animals, but persons sensitive to phenols may find it objectionable.

The manufacturer has classified into three groups the species of plants that are most commonly dealt with in brush-control programs, such classification depending on the effect obtained when the plants are sprayed with 2,4-D Ester. The first group of plants, classified as "susceptible," includes those whose leaves and current year's growth are readily killed, and whose eradication by repeated treatment is possible. In this group are such species as alder, aspen, cottonwood, birch, boxelder, wild cherry (except choke cherry), grape, hazel, honeysuckle, lead plants, Cherokee rose, sagebrush, poison sumac and sumac, tamarisk, Virginia creeper, black walnut, and some willows.

A second group of plants is classified as "intermediate." When these plants are sprayed the leaves and current year's growth are killed under favorable conditions or with high concentrations. Eventual kill is said to be possible with repeated treatment. This group includes barberry, buckrush, elm, gooseberry, gum, mulberry, currant, elderberry, wild plum, poison ivy, and Tree of Heaven.

A third group of plants is resistant; neither leaves nor stems are seriously injured by 2,4-D Ester. In this group are ash, beech, blackberry, red cedar, hackberry, hickory, maple, oak, osage orange and raspberry. In addition this group includes most needle-leafed evergreens, except in the seedling stage.

To kill or control the species in the resistant group, the manufacturer recommends the use of two other of its products, Atlacide and Atlas "A." These products, it is said, will kill practically all species, including grasses, and should, therefore, not be used if it is desired to retain the grass.

Joint Bar Filler

THE Dearborn Chemical Company, Chicago, has developed a new mastic material, known as No-Ox-Id Joint Bar Filler, to seal the openings at the ends of joint bars for protection against brine, dirt and abrasive materials stirred up by the passage of high-speed trains.

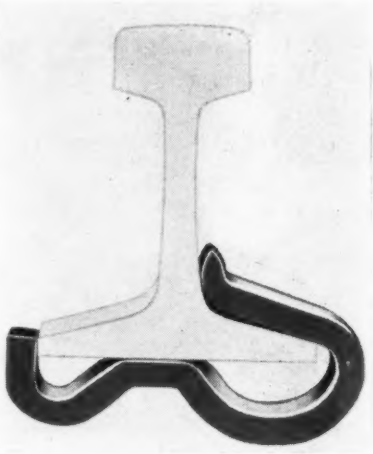
This product, having a consistency similar to that of putty, is applied by a paddle or putty knife to the ends of the joint bars after the joint is permanently assembled. It hardens with age, but is said to retain resilience and not become brittle. It is a compound formulated from No-Ox-Id, a rust preventive and lubricant manufactured by this company, which is applied to the rail ends and the fishing surface of rail heads before the joint bars are applied.

No-Ox-Id Joint Bar Filler being applied at one end of a joint bar in track

Rail Anchor

THE Improved Gautier rail anchor, recently introduced by the Mid-West Forging & Manufacturing Co., Chicago, is said to be easier to apply and to have better holding power than the former model. Another feature of the improved anchor is that it has four bearing points on the rail.

The Improved Gautier is a one-piece anchor, made of 1⅛-in. by ¾-in. alloy spring-steel bars. To install the anchor, only two steps are necessary. It is first hung on the rail against the tie and then locked securely to the bottom of the rail by one hard and one light blow with a spike maul. Overdriving is prevented by the loop end of the anchor which bears against the fillet joining the web and base of the rail. The anchor can be removed quickly by striking down on the opposite end.



The Improved Gautier rail anchor fitted on the base of the rail

Because the bend radii are large, localized stresses are said to be eliminated, and the anchor can, therefore, it is claimed, be applied and reapplied without impairment of its holding power. It is claimed further that the

(For additional information regarding any of the products described on this page, use post cards, page 433)

improved anchor has a substantial takeup, and that it can, therefore, be used on old rails as well as new.

The improved anchor is said to provide a large bearing area against both the tie and the rail. Also, the load is said to be distributed widely and evenly, eliminating points of concentrated loading.

Motor-Car Cabs and Windshields

TWO improved products for the protection of motor-car operators—an aluminum cab and an aluminum windshield—have been developed by Fairmont Railway Motors, Inc., Fairmont, Minn.

The cab, reported to be durable as well as light in weight, is designed for use on Fairmont M9 and M19 inspection motor cars. Because it extends over the wheel guards and has side panels, the operator is said to be well protected. Aluminum alloy is used for the framework, front and side sheets, and the top of the cab. It has safety-glass front and side windows, large in size for good visibility. The windows are rubber mounted to cushion the glass and seal the joints. The rear support of the cab is said to be flexible enough so that distortion of the car frame at curves, set-offs, etc., will not strain the cab proper. Available for use with these cabs are sliding side curtains and also a rear window section with curtain.

The newly-developed windshields are also said to be durable as well as light in weight. In these units sheet aluminum is riveted to a framework of welded aluminum alloy. They are each made in two sections which are joined by a continuous hinge covered with weather stripping to prevent any leakage at the joint. The upper section can be set in a vertical position or tilted either forward or backward, and is held in any position by a telescoping brace having a hand lock screw. This section is fitted with panels of ¼-in. safety plate glass mounted in rubber.

All screws, bolts and nuts used in the windshields proper are rust-proofed. These windshields are standardized in three basic models, one for inspection cars, another for section cars, and the other for gang cars. The one for inspection cars is 51 in. wide and has two window openings, each 13¾ in. by 22¼ in. Those for section and gang cars are 60¾ in. wide and have two windows, each 13¾ in. by 27¼ in. All have front hand rails.

Nalco Meterchem Valve

A NEW flow control valve, known as the Nalco Meterchem valve, for regulating the flow of solutions of water-treating chemicals, has been announced by the National Aluminate Corporation, Chicago. The rate of flow is controlled by rotating an iron disc by a handle and stem. As the disc rotates from the closed to the fully-open position it uncovers a port in the seat plate in such a manner that the area of opening varies with the position of the handle. A calibrated dial and pointer arrangement makes valve settings visible at a glance, a feature said to increase the accuracy of setting and resetting.

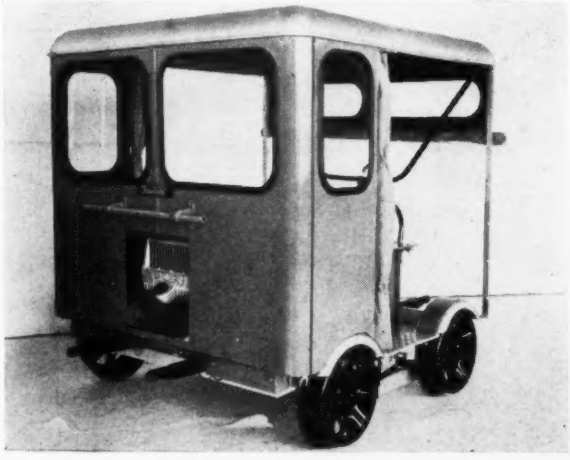
Another feature of the new valve is a two-part housing which can be disassembled to facilitate the cleaning of the valve. A standard ¾-in. pipe tap on each half of the housing is provided for installing the valve in the chemical solution pipe line between the chemical pump and the water storage tank.

The Nalco Meterchem Valve

Small Sand Plant

A NEW sanding plant of small capacity designed especially for use in yards to service Diesel switching locomotives has been developed by the T. W. Snow Construction Company, Chicago. Complete in every respect, except for an air supply and a sand dryer, this unit consists essentially of a sand-storage tank, with a capacity of two or three tons, mounted on a steel tower. It is shipped in two sections, with the lower or base section serving as a sand-elevating drum from which dry sand is forced by air pressure up into the storage tank. The sand drum is equipped with a fill inlet, with cap, through which sand is poured by hand, and an air hose which can be connected to any air source, including the air line on a switch engine.

The sand flows by gravity from the overhead storage tank through a twin-

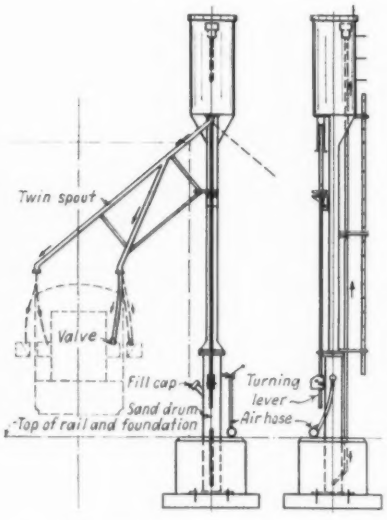


Above — The Fairmont aluminum cab for M9 and M19 inspection cars

Right-One of the new aluminum windshields fitted on a motor car

(For additional information regarding any of the products described on this page, use post cards, page 433)

spout arrangement, which makes it possible to fill the sand pockets on each side of an engine simultaneously. Each spout is equipped with a hose pendant, fitted at its outlet end with a specially-designed sand valve, said to give the operator instant control of the sand flow. The spout bracket can be swung forward or backward from its non-operating position parallel with the track, and can thus serve engines on two different tracks. The movements of the spout are controlled from the ground by means of an extension shaft and lever, and no cables, chains, counterweights or sheaves are used.



Two elevations of the T. W. Snow small sand plant

Wire Rope Slings

A PROGRAM in the development and perfection of wire-rope slings has been recently carried out by the American Chain & Cable Co., Wilkes-Barre, Pa. In connection with this program, it was determined that a means must be found for making loop ends which would not weaken the wire rope. The Acco-Loc Safety Splice was the result. Laboratory tests, it is said, showed that this splice is stronger than the rope. As used on Acco's Strand-Laid and Cable-Laid Slings this splice has two swaged collars which are said to eliminate bulk and permit close snubbing. One of the collars completely encloses the wire ends and removes the danger of protruding wires injuring workers or snagging their clothing.

The perfection of the Acco-Loc Safety Splice has been a factor in this company's production of a new line of wire-rope slings in certain diameters and various lengths. Known as Strand-Laid and Cable-Laid Slings, they are stocked at the factory, in district warehouses and in local supply houses to bring the slings close to the job and to make them immediately available. The slings have warranted safety factors and definite rated capacities.

An advantage claimed for factory-stocked slings is that an assortment of sling legs and fittings can be carried to provide the exact sling for lifts as they come. It is said that these interchangeable stock slings and specially-designed fittings will handle about 90 per cent of routine sling lifts.

Insulated Pipe Units

Insulated pipe units for housing underground, surface or overhead distribution systems for products that require insulation to prevent heat loss, have been recently introduced into the railroad field by the Ric-Wil Company, Cleveland, Ohio. Fabricated in standard 21-ft. lengths, the units house the pipes and insulation in a 16-gage, helically-corrugated, galvanized-iron Helcor conduit of welded construction, which is covered by a heavy coating of high-temperature asphalt and a tension wrapping of asphalt-saturated asbestos felt to seal against moisture. The strength of the Helcor conduit is said to permit installations underground in narrow, shallow trenches under or near railroad tracks.

The ends of each unit, with heavy iron collars welded to the ends of the Helcor conduit, are sealed with a heavy ring of insulating cement and made watertight by treated asbestos calking and a special waterproof cement. Ric-Wil insulated pipe units can also be furnished with cast-iron conduit instead of Helcor conduit.

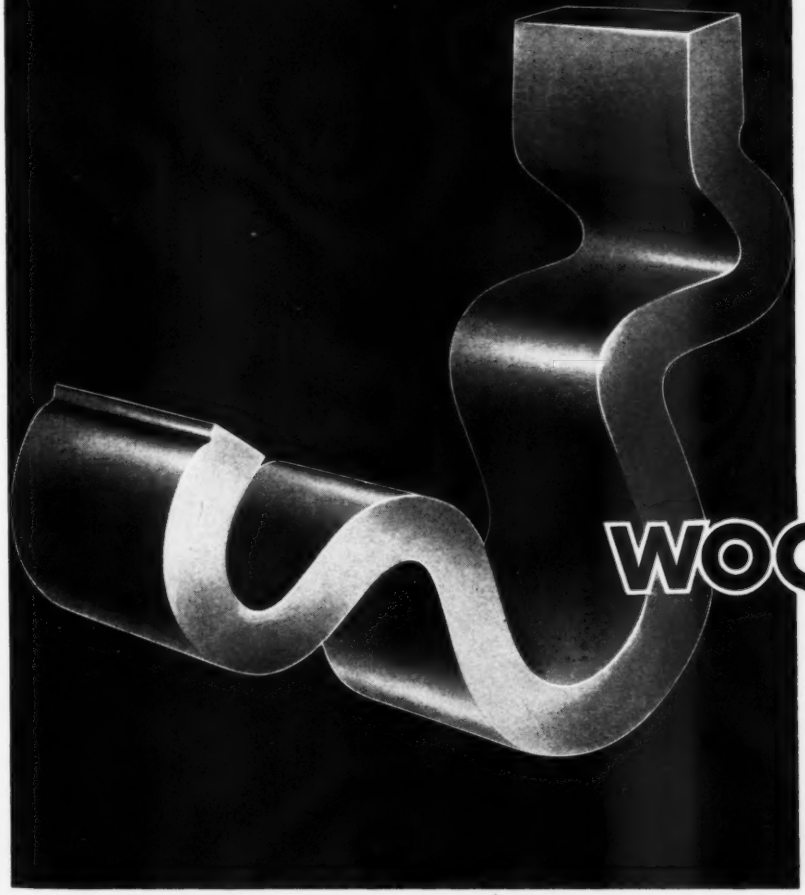
Installing Ric-Wil insulated pipe units in a shallow trench

Two Acco registered braided slings and two strand laid slings used in a wrecking operation

(For additional information regarding any of the products described on this page, use post cards, page 433)

We wouldn't say this unless we could prove it!

THE NEW WOODINGS
ADVANCED TYPE RAIL ANCHOR



"It's the World's most POWERFUL Rail Anchor"

WOODINGS
FORGE & TOOL CO.
VERONA, PA.
CHICAGO, ILL.

THE MONTH'S NEWS

Happenings among railway men— the associations—the suppliers

Changes in Railway Personnel

General

David E. Smucker, superintendent of the Pittsburgh division of the Pennsylvania, with headquarters at Pittsburgh, Pa., and an engineer by training and experience, has been appointed general manager of the Long Island, with headquarters at Jamaica, N.Y., having entire supervision over operation, including responsibility for all traffic matters and relations with the public.

Engineering

J. E. Armstrong, Jr., division engineer on the Canadian Pacific at Sudbury, Ont., has been promoted to assistant district engineer, with headquarters at North Bay, Ont.

J. F. Pinson, assistant engineer in the office of the assistant chief engineer of the Chicago, Milwaukee, St. Paul & Pacific, at Seattle, Wash., has retired after nearly 46 years of service with the railroad.

R. R. Rhode, division engineer on the Northern Pacific at Missoula, Mont., has resigned to accept the position of bridge engineer of the Duluth, Missabe & Iron Range, with headquarters at Duluth, Minn.

A. J. Rankin, assistant engineer on the Texas & Pacific, with headquarters at Dallas, Tex., has been appointed assistant engineer at Alexandria, La., to succeed **H. L. Bunn,** whose death was reported in the March issue.

R. W. Putnam, assistant engineer, maintenance of way and structures, of the Southern Pacific, Pacific Lines, has been promoted to engineer maintenance of way and structures, effective April 1, with headquarters as before at San Francisco, Cal., succeeding **F. L. Guy,** who has retired.

Max Nearing, assistant division engineer of the New York Central, at Cleveland, Ohio, has been appointed assistant engineer in the district engineer's office at that point. **C. C. Herrick,** assistant engineer in the division engineer's office at Chicago, succeeds Mr. Nearing at Cleveland.

R. W. Humphreys, assistant bridge and building supervisor on the Northern Pacific, has been promoted to division engineer at Missoula, Mont., to succeed **R. R. Rhode,** whose resignation to accept the position of bridge engineer on the Duluth, Missabe & Iron Range is noted elsewhere in these columns.

G. W. Harris, chief engineer system of the Atchison, Topeka and Santa Fe, with headquarters at Chicago, has retired after 50 years' service with this company, during 20 years of which he was chief engineer.

J. C. Jacobs, division engineer on the Illinois Central at Jackson, Tenn., has been appointed acting assistant engineer maintenance of way, with headquarters at Memphis, Tenn., to replace **J. E. Rogan,** Chicago, who is off duty because of illness. **E. F. Snyder,** supervisor of track at Corinth, Miss., has been appointed acting division engineer at Jackson, to succeed Mr. Jacobs.

A. A. Johnson, engineer maintenance of way of the Delaware, Lackawanna & Western, with headquarters at Hoboken, N.J., has been promoted to assistant chief engineer at Hoboken and **John P. Hiltz, Jr.,** engineer of track at Scranton, Pa., has been promoted to engineer maintenance of way, to succeed Mr. Johnson, with headquarters as before at Scranton.

H. M. Shepard, assistant engineer on the Erie, at Cleveland, Ohio, has been promoted to assistant to chief engineer, with the same headquarters, and **B. Elkind,** office engineer, has been advanced to principal assistant engineer. **L. S. Rose,** assistant engineer, has been appointed special engineer, to succeed **H. F. King,** who has retired after 36 years of service with the company.

Herbert G. Dennis, division engineer of the Chicago, Rock Island & Pacific, with headquarters at Des Moines, Iowa, has been promoted to district maintenance engineer, with headquarters at Kansas City, Mo., succeeding **C. B. Murray,** who has been transferred to Pratt, Kan. Mr. Dennis is succeeded by **Raymond M. Bristow,** assistant engineer on the Des Moines division.

Kenneth E. Stephenson, whose appointment as assistant division engineer on the Chesapeake & Ohio, with headquarters at Ashland, Ky., was reported in the February issue, was born at Danville, Va., on February 6, 1911, and attended Washington and Lee university. He entered the service of the C. & O. in October, 1937, as a rodman at Van, W. Va., and was later transferred to Huntington. In May, 1941, he was appointed draftsman in the real estate department, returning to the maintenance of way department as a rodman in 1942. From May, 1942, to December, 1946, he served successively as assistant engineer and assistant cost engineer, being advanced to supervisor of track on the latter date. He was holding this position at the time of his recent appointment.

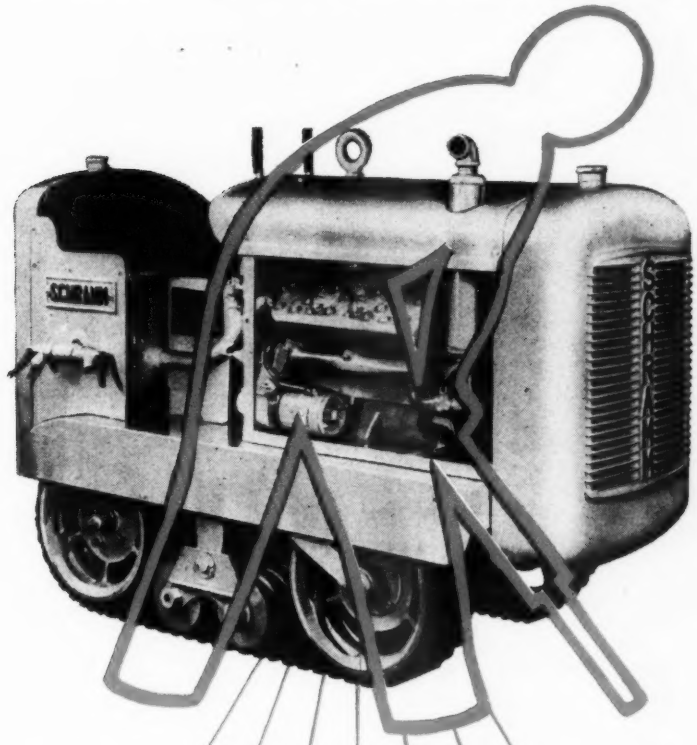
George C. Lindsey, whose appointment as assistant engineer of structures on the New York Central, with headquarters at Cleveland, Ohio, was reported in the February issue, was born on November 20, 1885, at Carlisle, Pa., and was graduated from Dickinson College with a B.A. degree in 1908. In 1913 he received an M.A. degree from that college, and a degree of B.S. in civil engineering from Pennsylvania State College. Mr. Lindsey entered the service of the New York Central in November, 1917, as a designer at Cleveland, and in 1920 was advanced to assistant chief draftsman. In 1927 he was made assistant engineer in charge of movable bridges and equipment, and from 1940 to 1948 was assistant engineer in charge of design, the position he held at the time of his recent appointment.

Harmon A. Hunt, assistant division engineer on the Southern Pacific, at El Paso, Tex., has been appointed resident engineer, with the same headquarters. Mr. Hunt was born at Paris, Tex., on September 24, 1904, and entered the service of the T. & N. O. in November, 1925, as a rodman at Langtry, Tex. In 1926 he went with the Carnegie Steel Company as instrumentman, and in 1928-29 he served in the same capacity with the state highway department at Houston, Tex. In 1930 he was engaged in newspaper work, returning to the T. & N. O. in October of that year as instrumentman at Houston. He served successively as inspector, draftsman, system bridge and building inspector, and bridge and building supervisor, until November, 1947, when he was promoted to assistant division engineer.

Arthur J. Anderson, whose promotion to division engineer on the Chicago, Milwaukee, St. Paul & Pacific, at Spokane, Wash., was announced in the March issue, was born at Chicago on January 7, 1906, and attended the University of Wisconsin. He entered railroad service with the Illinois Central in 1925, and in April, 1929, went with the Milwaukee as an instrumentman, serving in this capacity at various locations until September, 1936, when

(Continued on page 424)

SCHRAMM MODEL 60 CRAWLER AIR COMPRESSOR



It goes where the work is

In railroad maintenance, the swing is to off-track compressors in small capacity units. Flexibility is the big reason, for they make it easy to tailor the equipment for the job at hand, whether it be out-of-face or spot tamping. And trackmen say that the Schramm Model 60 is the handiest compressor that ever climbed a fill. Riding on its crawler treads, it goes merrily along, even to places difficult to reach. The result is that you will find lots of uses for it, even when there is no ballast that needs tamping.

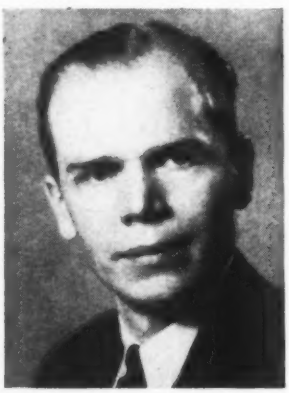
We want to tell you more about the Schramm Model 60 Crawler—its unique power plant, its compactness, and its adaptability to other jobs besides supplying compressed air. Get your copy of bulletin FC 48 from the Railway Sales Division, Schramm, Inc., "The Compressor People," West Chester, Pennsylvania.

Perfect for every air use

Railway Personnel (Cont'd.)

he was appointed assistant engineer and later office engineer at Seattle. In 1942 he was advanced to assistant division engineer at Spokane, and from July of that year until June, 1947, he was on leave of absence with the U. S. Navy, where he served as a lieutenant commander in the Pacific. In July, 1947, he returned to the Milwaukee as assistant division engineer at LaCrosse, Wis., and was holding this position at the time of his recent promotion.

R. A. Emerson, district engineer of the Canadian Pacific at Vancouver, B.C., has been appointed engineer of track, with



R. A. Emerson

headquarters at Montreal, Que. In his new duties, Mr. Emerson will be responsible for the design and preparation of plans for track and roadway standards and for matters having to do with clearances for equipment and oversize loads for the entire system. Born at Plum Coulee, Man., Mr. Emerson is a graduate of the University of Manitoba and undertook postgraduate studies at Yale university in 1933-34. His career with the Canadian Pacific began permanently in 1935 as a transitman on the Kenora division, although he had held temporary jobs since 1928, while pursuing his education. In 1939 he became roadmaster on the Portage division and was appointed division engineer at Brandon, Man., in 1941, transferring to Moose Jaw, Sask., in 1943. Mr. Emerson went to Vancouver in 1944, where he served successively as assistant district engineer and district engineer.

Walter E. Heimerdinger, whose appointment as engineer of bridges of the Chicago, Rock Island & Pacific, at Chicago, was reported in the February issue, was born on February 12, 1889, at Vulcan, Mich., and received his higher education at the University of Michigan. He began his railroad career in 1911 as an assistant on the engineer corps of the Rock Island, and subsequently served as building inspector and instrumentman. Mr. Heimerdinger was, successively, engineer on construction work and assistant engineer, before entering military service during World War I as a lieutenant in the field artillery. He returned to the road in 1919 and held positions successively as assistant engineer, office engineer, resident engineer, roadmaster, division engineer, locating engineer, district maintenance engineer, division superintendent and acting assistant chief engineer. Mr. Heimerdinger was serving in the latter position at the time of his recent appointment.

Bridge and Building

Burt F. Francis, supervisor of bridges and buildings on the New York Central at Jersey Shore, Pa., has retired after more than 46 years of service.

R. M. Vance has been appointed assistant supervisor of bridges and buildings and water supply on the Chesapeake & Ohio, with headquarters at Rainelle, W. Va.

Gustave C. Johnson, whose promotion to supervisor of bridges and buildings on the Chicago & North Western, with headquarters at Chicago, was reported in the March issue, was born in Sweden on April 25, 1908, and entered the service of the North Western in August, 1926, as a helper in the bridge and building department. He subsequently served as bridge and building carpenter, and assistant bridge and building foreman, and in 1933 was advanced to bridge and building foreman. In 1944 he was appointed general foreman in charge of ore dock repairs at Escanaba, Mich., and in April, 1946, he was made assistant supervisor of bridges and buildings at West Chicago, Ill., the position he was holding at the time of his recent promotion.

J. D. Moore, assistant master carpenter on the Philadelphia Terminal division of the Pennsylvania, has been promoted to master carpenter on the Toledo division, to succeed **W. T. League** who has been transferred to the Cincinnati division to replace **F. L. Lee** who in turn succeeds **W. D. Conrad** on the Eastern division. Mr. Conrad has been transferred as master carpenter to the office of the chief engineer maintenance of way on the Central region, with headquarters at Pittsburgh, Pa. **S. G. Wintoniak,** assistant master carpenter on the Maryland division, has been transferred to the Philadelphia Terminal division, to succeed Mr. Moore, and **Gustave Von Behren,** foreman of bridges and buildings on the Maryland division, has been promoted to assistant master carpenter on the Maryland division, to succeed Mr. Wintoniak.

Millard J. Hubbard, whose appointment as general supervisor of bridges and buildings on the Chesapeake & Ohio, with headquarters at Richmond, Va., was noted in the February issue, was born at Mayfield, Ky., on September 18, 1906, and was graduated from the University of Kentucky with a B.S. degree in civil engineering in 1930. In June of that year he entered the service of the C. & O. as a carpenter helper on the Ashland division, and in 1933 he was made first grade carpenter. He served, successively, as instrumentman on the engineer corps, assistant cost engineer and assistant yardmaster until December, 1943, when he was appointed assistant division engineer at Columbus, Ohio. In June, 1945, he was promoted to division engineer at Columbus.

Special

Walter Roy Gibbons, real estate and tax agent of the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Cincinnati, Ohio, and an engineer by training and experience, has retired.

George F. Drummond, assistant architect of the Canadian National System, has been promoted to chief architect, with headquarters as before at Montreal, Que.,

George F. Drummond

succeeding **John Schofield,** who has retired under the pension plan of the company.

Mr. Drummond was born at Glasgow, Scotland, in September, 1891, and served a number of years in private practice before joining the Canadian National in October, 1927, as assistant architect at Montreal. Since that time he has been associated with all the major building projects of the system, including stations, hotels and passenger car equipment. Mr. Drummond received his architectural training in the United Kingdom, and is a graduate of the Royal Technical College and Glasgow School of Art. After going to Canada he became well known for his work in designing commercial buildings, particularly bank structures, and larger types of residences.

Track

George W. Gearhart, inspector in the office of the manager of roadway maintenance on the Norfolk & Western, has been appointed assistant roadmaster on the Radford division, with headquarters at Pulaski.

Gustave J. Santangelo, track foreman on the Long Island, and **Harry A. Gluck,** general foreman, have been promoted to

(*Continued on page* 426)

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Railway Personnel (Cont'd.)

the newly-created position of assistant supervisor of track at Jamaica, L.I.

F. M. Harris, roadmaster on the Missouri Pacific, with headquarters at Arkansas City, Kan., has been transferred to Marianna, Ark., succeeding **O. G. O'Bryant,** who has resigned. **J. H. Gibbs,** roadmaster at Coffeyville, Kan., has been transferred to Arkansas City, to replace Mr. Harris.

William P. Higginbottom, whose appointment as track supervisor on the Southern, with headquarters at Huntsville, Ala., was announced in the March issue, was born at Tuscumbia, Ala., on June 15, 1912, and entered railroad service in May, 1927, as a section laborer on the Southern at Sheffield, Ala. In July, 1937, he was made section foreman on the Memphis division, and from 1940 to 1945 served as extra-gang foreman. He was promoted to assistant supervisor in May, 1945, and was holding this position at the time of his recent appointment.

L. W. Howard, supervisor of track on the Illinois Central, with headquarters at Grenada, Miss., has been appointed acting supervisor of track at Corinth, Miss., to succeed **E. F. Snyder,** whose appointment as acting division engineer is noted elsewhere in these columns. **T. B. Greer,** supervisor of track at Tutwiler, Miss., has been appointed acting supervisor of track at Grenada, to replace Mr. Howard, and **T. A. Winburn** has been made acting supervisor of track at Tutwiler, to succeed Mr. Greer.

A. L. Coyner, whose promotion to supervisor of track on the Chesapeake & Ohio, with headquarters at Cane Fork, W. Va., was noted in the February issue, was born on April 30, 1909, at Teays, W. Va., and entered the service of the C. & O. in June, 1924, as a track laborer at Huntington, W. Va. He subsequently served as a welder helper and maintenance of way welder at that point, and in 1940 was made assistant maintenance of way foreman. He was advanced to maintenance of way foreman in 1941 and was holding that position at the time of his promotion to supervisor of track.

Obituary

George Spicer, retired roadmaster on the Canadian Pacific at Trenton, Ont., died recently. He was 83 years old.

Frank R. Goulding, assistant engineer in the office of the chief engineer of the Central of Georgia, at Savannah, Ga., died on February 1, after a short illness.

F. S. Hewes, office engineer on the Atchison, Topeka & Santa Fe, with headquarters at Chicago, died at a hospital in that city on March 3, following a short illness.

Fred L. Thompson, who retired in 1942 as vice-president in charge of engineering of the Illinois Central, died at his home in Chicago on February 27, following a short illness.

Association News

Metropolitan Maintenance of Way Club

The next meeting of the club, which will be the annual meeting with election of officers, will be held on April 29 in the Skyline room of the Hotel Sheraton, New York, beginning with dinner at 6:30 p.m. The feature of this meeting will be an address by E. T. Moore, chief executive officer, Central Railroad of New Jersey, on "Taking More of the Guesswork Out of Maintenance."

Bridge & Building Association

Taking advantage of the plans of many of its officers to attend the annual meeting of the American Railway Engineering Association in Chicago during the week of March 15, the Executive committee of the Bridge & Building Association met in Chicago on March 16. With the work of all technical committees well under way, the purpose of the meeting was essentially to handle routine association matters, looking to increasing membership and a highly successful convention in September, concurrent with that of the Roadmasters' association.

Roadmasters' Association

The Executive committee of the association held a meeting in Chicago on March 15, in conjunction with the annual meeting of the American Railway Engineering Association, and not only reviewed the status of routine association matters, but also preliminary plans for the convention to be held in September concurrent with that of the American Railway Bridge & Building Association. One matter being given serious consideration is an amendment to the Constitution increasing the annual dues of members from $4 to $5, beginning with the next fiscal year of the association, January 1, 1949.

The next meeting of the Executive committee will be held at the Chicago Engineers' Club, Chicago, on July 12, for the primary purpose of reviewing preliminary drafts of all of the technical committee reports to be presented before the annual meeting in September.

Maintenance of Way Club of Chicago

The feature of the last meeting of the club, held on March 23 at Harding's at the Fair, was a highlight review of the recent A.R.E.A. convention, by G. M. O'Rourke, assistant engineer maintenance of way of the Illinois Central. In his summary Mr. O'Rourke paid particular attention to the observations, recommendations and conclusions of those committees dealing specifically with matters pertaining to the various elements of the roadbed and track structure.

The next meeting, which will be held at Hardings on April 26, will be the annual meeting of the club, with election of officers. This meeting will take the form of an "old-timers" night, in a program which will review the organization and early days of the club, and which will do special honor to those charter members and early officers who are still living. This part of the program will be conducted by Walter S. Lacher, himself a charter member of the club and its secretary-treasurer for many years.

National Railway Appliances Association

The exhibit of the association, held at the International Amphitheatre, Chicago, March 15-18, in conjunction with the annual meeting of the American Railway Engineering Association, was an outstanding event of "railway engineering week" in Chicago. Altogether, 100 member companies presented exhibits covering a wide range of equipment, tools, appliances and materials of interest to the engineering and maintenance forces of the railways. Elsewhere in this issue is a two-page spread of random candid photographs taken during the exhibit, showing a few of the railway supply representatives and railway men present.

The exhibit this year was carried out under the general direction of C. L. Mellor, president of the association (Barco Manufacturing Company), and R. B. Fisher, secretary, director of ex-

(*Continued on page* 428)

Meetings and Conventions

American Railway Bridge and Building Association—Annual meeting, September 20-22, 1948, Hotel Stevens, Chicago. Elise LaChance, secretary, 431 S. Dearborn street, Chicago 5.

American Railway Engineering Association—Annual Meeting, March 15-17, 1949, Chicago. W. S. Lacher, secretary, 59 E. Van Buren street, Chicago 5.

American Wood-Preservers' Association—Annual meeting, April 27-29, 1948, St. Paul, Minn. H. L. Dawson, secretary-treasurer, 1429 Eye street, N.W., Washington 5, D. C.

Bridge and Building Supply Men's Association—Joint exhibit with Track Supply Association, September 20-22, 1948, Hotel Stevens, Chicago, during concurrent conventions of American Railway Bridge and Building Association and Roadmasters' Association. E. C. Gunther, secretary, 122 S. Michigan avenue, Chicago 3.

Maintenance of Way Club of Chicago—Next meeting, April 26, 1948. C. R. Knowles, secretary-treasurer, 105 W. Adams street, Chicago 3.

Metropolitan Maintenance of Way Club—Next meeting, April 29, 1948, Skyline Room of the Hotel Sheraton, New York. John S. Vreeland, secretary, 30 Church street, New York.

Railway Tie Association—Annual meeting, August 30-September 1, 1948, Greenbriar Hotel, White Sulphur Springs, W. Va. Roy M. Edmonds, secretary-treasurer, 610 Shell Building, St. Louis 3, Mo.

National Railway Appliances Association—R. B. Fisher, secretary, 1 No. LaSalle street, Chicago 4.

Roadmasters' and Maintenance of Way Association of America—Annual meeting, September 20-22, 1948, Hotel Stevens, Chicago. Elise LaChance, secretary, 431 S. Dearborn street, Chicago 5.

Track Supply Association—Joint exhibit with Bridge and Building Supply Men's Association, September 20-22, 1948, Hotel Stevens, Chicago, during concurrent conventions of Roadmasters' Association and American Railway Bridge and Building Association. Lewis Thomas, secretary, 59 E. Van Buren street, Chicago 5.

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"The chemical that you sold me last year was the best that I have ever used— and not a single cattle claim"

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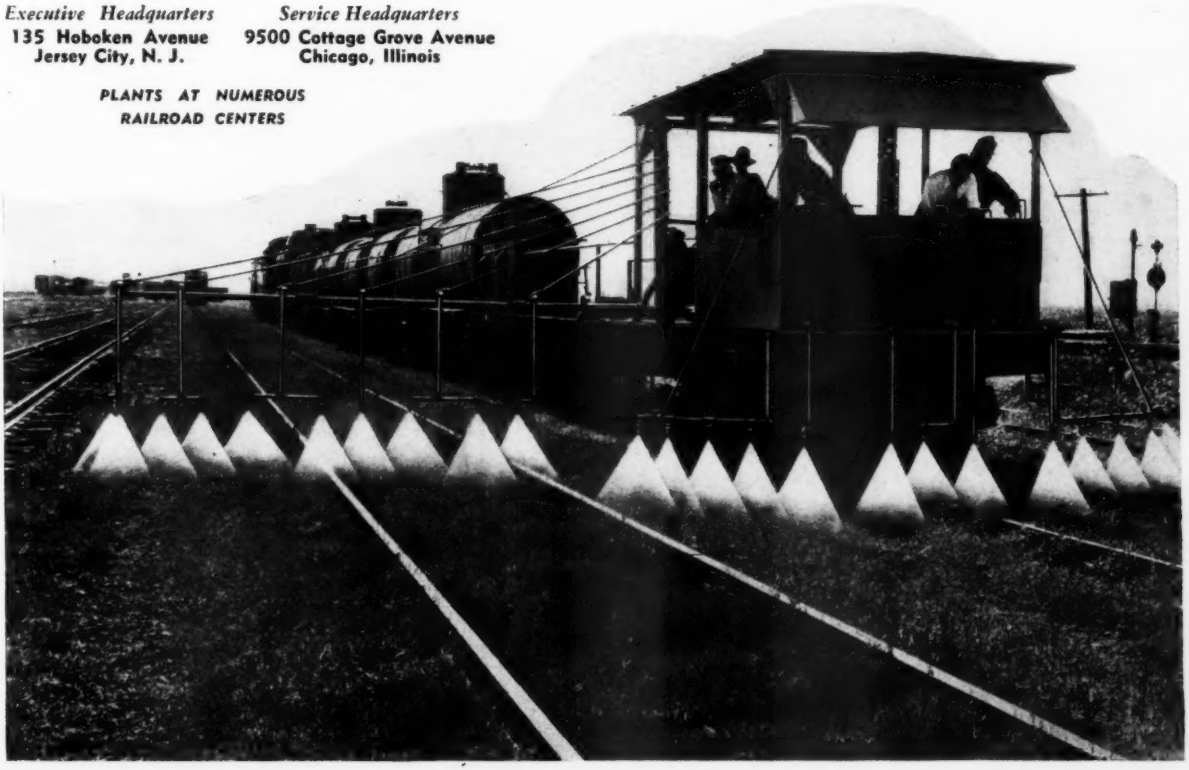

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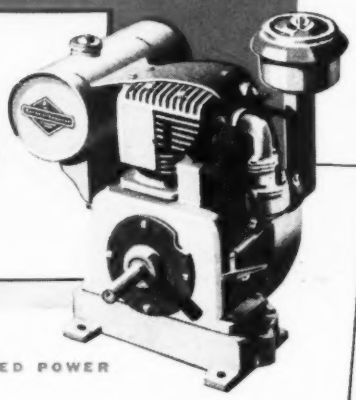

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WORLD WIDE Factory Supervised Service

Association News (Cont'd)

hibits and chairman of the exhibit committee (Buda Company). At the annual meeting of the association held during the exhibit, the following officers were elected for the ensuing year: President, M. K. Ruppert (The P. & M. Co.); vice-president, H. M. McFarlane (O. F. Jordan Company); treasurer, Jess Mossgrove (Austin-Western Company); and secretary (re-elected), R. B. Fisher. J. B. Templeton (Templeton, Kenly & Co.), and E. W. Backes (Carnegie-Illinois Steel Corporation) were elected directors to serve for terms of two years. Other directors of the association are E. D. Cowlin (Eaton Manufacturing Company—Reliance Division); W. H. Tudor (International Harvester Company—Industrial Power Division); and R. A. Carr (Dearborn Chemical Company). Mr. Mellor remains as director pro-tem for one year.

Wood-Preservers' Association

Plans are complete looking toward a highly successful annual meeting of the association in St. Paul, Minn., April 27-29. The convention headquarters will be the Hotel St. Paul, and members desiring room accommodations should make request through Walter C. Reichow, chairman of the hotel committee, c/o Great Northern Railway, General Offices, St. Paul 1, Minn. The Burlington Railroad has been selected as the official route to the meeting from Chicago and plans involve a special train, which will leave the Union Station at 9 a.m. (CST), Monday, April 26. This will be operated as a second section of the Burlington's morning Zephyr and will include one of the road's new Vista Dome cars. Application for space on this train should be made through W. M. Moloney, general agent of the Burlington at 105 W. Adams St., Chicago 3.

American Railway Engineering Association

At the annual meeting of the association in Chicago on March 16-18, with 1,690 members and guests in attendance, it was announced that the following officers had been elected to serve during the ensuing year:

President, C. H. Mottier, vice-president and chief engineer, Illinois Central System, Chicago; vice-president to serve for two years, G. L. Sitton, assistant chief engineer, Southern, Washington, D. C. The directors named were E. C. Vandenburgh, chief engineer, Chicago & North Western, Chicago; C. G. Grove, chief engineer maintenance of way, Western region, Pennsylvania, Chicago; and R. L. Groover, chief engineer, Atlantic Coast Line, Wilmington, N. C. Members of the nominating committee are I. H. Schram, chief engineer, Erie, Cleveland, Ohio; E. J. Brown, engineer of track, Burlington Lines, Chicago; E. E. Mayo, chief engineer, Southern Pacific, San Francisco, Cal.; W. L. Young, principal assistant engineer, Norfolk & Western, Roanoke, Va.; and M. H. Dick, managing editor,

(*Continued on page* 430)

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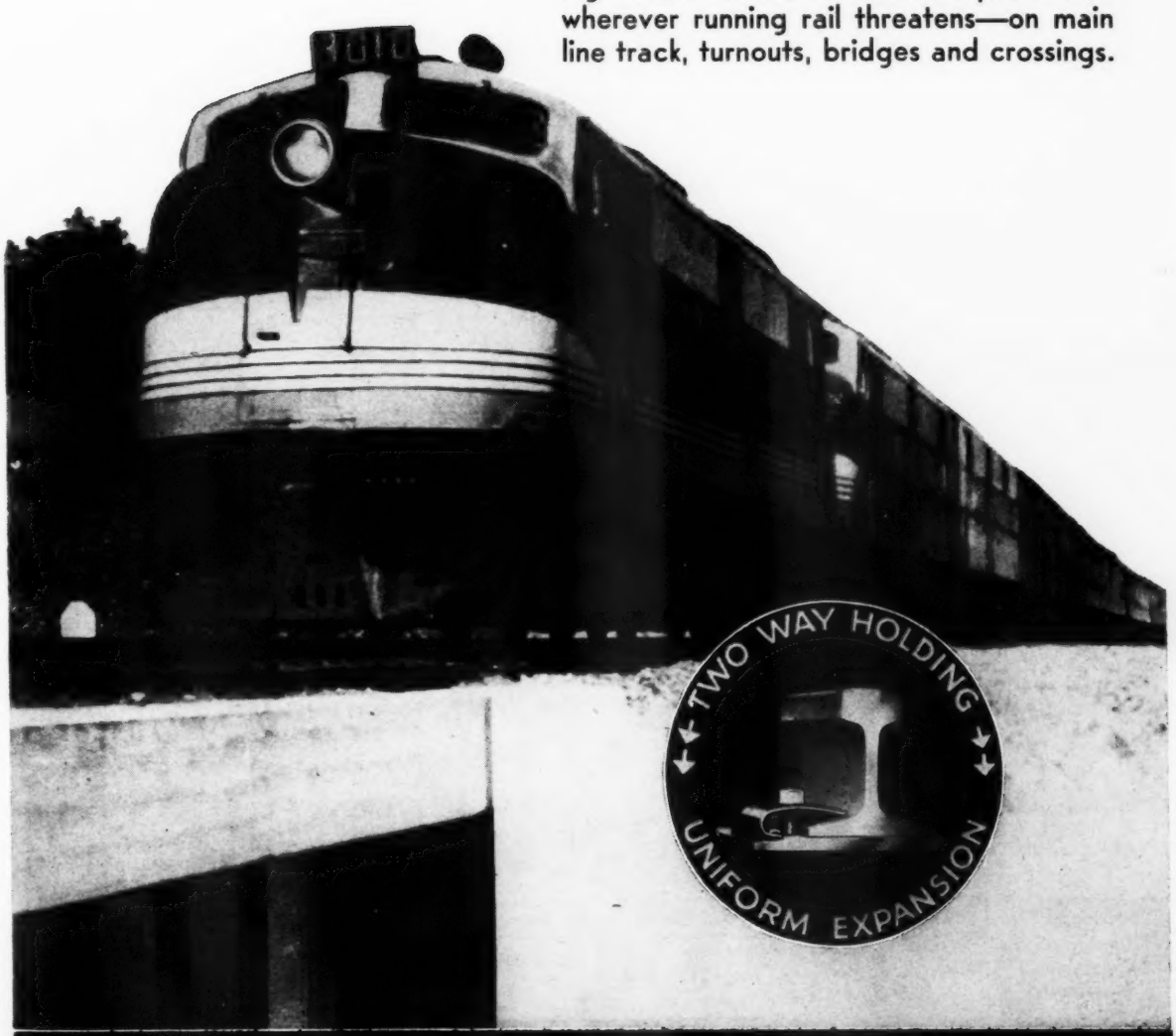
Compression-held track is anchored against traffic in either direction. Two-way holding offers sound, economical protection wherever running rail threatens—on main line track, turnouts, bridges and crossings.



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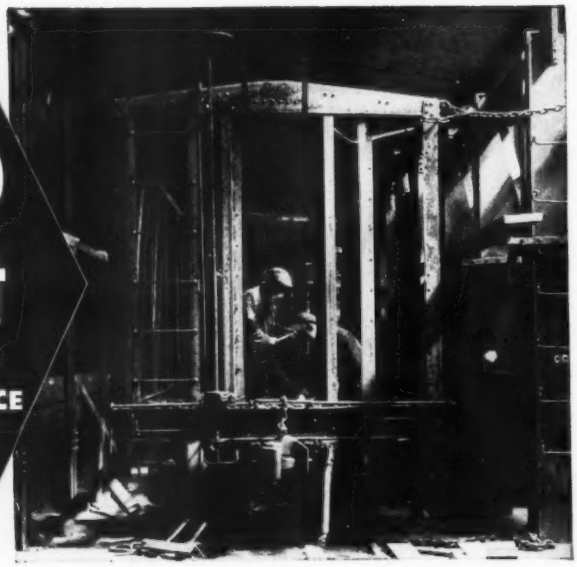

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Association News (Cont'd)

Railway Engineering and Maintenance, Chicago. In addition, F. S. Schwinn, assistant chief engineer, Missouri Pacific, Houston, Tex., and vice-president of the association, was advanced automatically to senior vice-president.

The Committees on Outline of Work and Personnel have completed the make-up of committees and assignment of subjects for the ensuing year, and a booklet containing this information will be mailed to all members on or before April 1. A number of the committees will begin the year's work with new chairmen or vice-chairmen, or both. These committees, with the new chairmen or vice-chairmen, are as follows:

Roadway and Ballast—H. W. Legro (chairman), engineer of grade crossings, Boston & Maine, Boston, Mass.; G. W. Miller (vice-chairman), district engineer, Canadian Pacific, Toronto, Ont.

Buildings—A. G. Dorland (chairman), assistant engineer, Elgin, Joliet & Eastern, Joliet, Ill.; J. B. Schaub (vice-chairman), assistant engineer buildings, Illinois Central, Chicago.

Wood Bridges and Trestles—C. V. Lund (chairman), assistant engineer, Chicago, Milwaukee, St. Paul & Pacific, Chicago; J. R. Showalter (vice-chairman), bridge engineer, Missouri Pacific, St. Louis, Mo.

Water Service and Sanitation—H. E. Silcox (chairman), assistant engineer water supply, Chesapeake & Ohio, Richmond, Va.; Guy E. Martin (vice-chairman), superintendent water service, Illinois Central, Chicago.

Economics of Railway Location and Operation—C. H. Blackman (chairman), chief engineer, Louisville & Nashville, Louisville, Ky.; John W. Barriger (vice-chairman), president, Chicago, Indianapolis & Louisville, Chicago.

Economics of Railway Labor — Herman E. Kirby (vice-chairman), cost engineer, Chesapeake & Ohio, Richmond, Va.

Co-operative Relations with Universities—S. R. Hursh (chairman), assistant chief engineer, maintenance, Pennsylvania, Philadelphia, Pa.; J. B. Akers (vice-chairman), chief engineer, Southern, Washington, D. C.

Waterproofing—R. L. Mays (vice-chairman), designing engineer, New York, Chicago & St. Louis, Cleveland, Ohio.

No committees have scheduled meetings to be held during April, but President Mottier has called a meeting of all committee chairmen to be held at the association's headquarters at Chicago on April 20.

Supply Trade News

General

A. F. Rolf, assistant secretary of the **Allis-Chalmers Manufacturing Company,** Milwaukee, Wis., for more than 25 years, has retired.

Gordon H. Proffitt, 547 Howard street, San Francisco 5, Cal., has been appointed to represent the **Q & C Co.** in the San Francisco territory, in place of **R. W. Jamison,** who has retired.

Russell S. Schmidt has been appointed manager of the Dealer Sales department of **Air Reduction Sales Company,** New York, to succeed **Dale D. Spoor** who has been promoted to sales promotion manager at that point.

(*Continued on page* 432)

Barber-Greene

358 HOPPER-CAR UNLOADER

Here is *the* versatile car unloader — capable of unloading a hopper car in 45 minutes — ideal for steam coal, coke, or other abrasive materials. A heavy-duty, all-material unloader, the 358 features a non-slip, non-plugging belt, precision transmission, antifriction bearings . . . is equally efficient over the rails or in track pits. Capacity up to 3 tons per minute.

363 BELT CONVEYOR

Here's the newest portable conveyor on the market! The 363 is a high-capacity one-man unit that will pay for itself on large or small jobs by reducing costly truck waiting time, speeding unloading and reclaiming work. Its advanced B-G design includes the sturdier yet lighter stair channel construction and features a removable tail pulley cover. Plain or cleated belt.

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These washers are strong and tough, yet provide the necessary "springing action" required at rail joints, frogs and crossings.

We control every step of their manufacture—from the specification of the specially-developed formula and process used in making the steel to the forming, hardening, tempering and testing operations.

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SPRING WASHERS
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Ohio Electric announces a welded lifting magnet with *PROTECTO-WELD* design

The easiest way to protect the weld on a welded lifting magnet is obvious: PUT IT ON TOP.

That's the big advantage of new Ohio PROTECTO-WELD magnets. Outer ring and top plate are welded together *on top of the magnet.* Frequent blows against the outer ring *cannot crack or damage the weld.* Ohio PROTECTO-WELD magnets remain hermetically sealed against moisture indefinitely!

Three sizes of this new magnet are now in production. They measure 39, 55 and 65 inches in diameter. Name the lifting job—we can give you all the strength you need. Besides the 4-coil construction, there are also 6 or 8-coil magnets for that *extra Ohio lifting strength.*

These PROTECTO-WELD magnets have the well known Ohio chain pins that fit into square-holed ears—to eliminate friction and prolong life. Ohio Armored Weatherproof cable connectors withstand severe abuse. Bayonet joints for hand operation save time in making and breaking connections. Shielded contacts provide safety from arcs.

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Supply Trade News (Cont'd)

John A. Hill, vice-president of **Air Reduction Company, Inc.,** New York, has been elected president, succeeding **Charles S. Munson,** who has been appointed chairman of the Executive committee. **William C. Keeley,** vice-president, has been elected chairman of the newly-created finance committee.

The Texas Company has announced the appointment of **J. M. McCraven** as manager of the railway traffic and sales department, with headquarters at New York, to succeed the late **J. L. Lavallee,** whose death is reported elsewhere in these

J. M. McCraven

columns. Mr. McCraven joined the Texas Company at Houston, Tex., in 1916, and worked successively as chief accountant, assistant district manager, district manager and assistant manager at Chicago,

E. J. McMahon, production manager of the **Dearborn Chemical Company,** has been elected a director and vice-president,

E. J. McMahon

to succeed **John W. Brashears,** who has retired after 52 years of service.

A. M. Davis, district engineer of the **Portland Cement Association,** with headquarters at Lansing, Mich., has been appointed manager of the association's midwestern offices at Chicago, succeeding

(*Continued on page* 436)

ADDITIONAL INFORMATION

On Any of the Products Mentioned in This Issue

Below is a complete index of the products referred to in both the editorial and advertising pages of this issue. If you desire additional information on any of them, use one of the accompanying addressed and stamped postcards in requesting it. In each case give name of product and page number. The information will come to you directly from the manufacturer involved, without any obligation on your part.

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30 CHURCH STREET
NEW YORK 7, NEW YORK

READER SERVICE DEPT.

RAILWAY ENGINEERING AND MAINTENANCE April, 1948

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RAILWAY ENGINEERING AND MAINTENANCE

April, 1948

Please send me additional products information as requested below.

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RAILWAY ENGINEERING & MAINTENANCE

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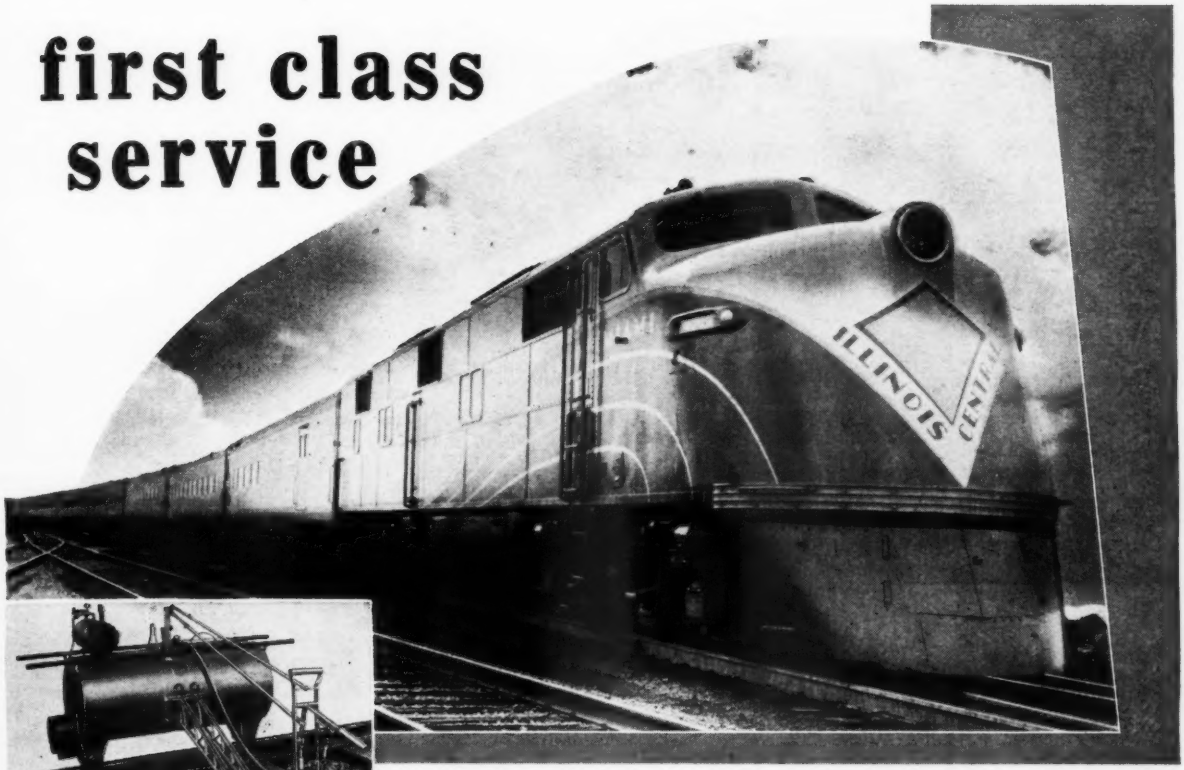
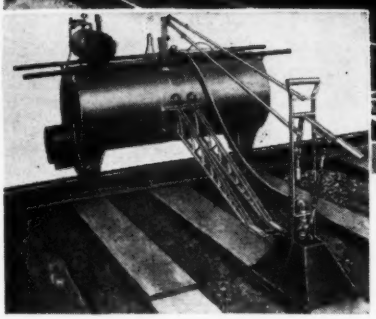
No Postage Stamp Necessary if Mailed in the United States

first class service





calls for first class maintenance

Just as the Illinois Central's progressive streamlined program provides its patrons with first class service, the use of WOOLERY Tie Cutters, Weed Burners, and Creosote Sprayers is a part of their progressive program of first class track maintenance.

CREOSOTE SPRAYERS

Two men operating this machine can do a safer, quicker, better job of creosoting newly-adzed ties than could a whole crew by old-fashioned methods.

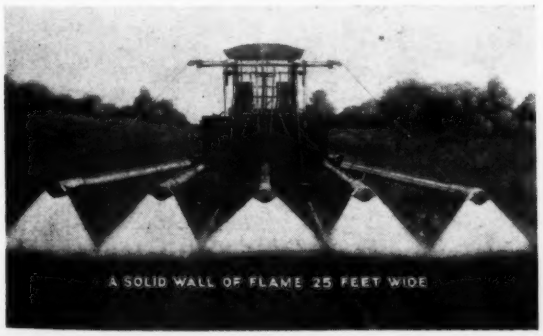
WEED BURNERS

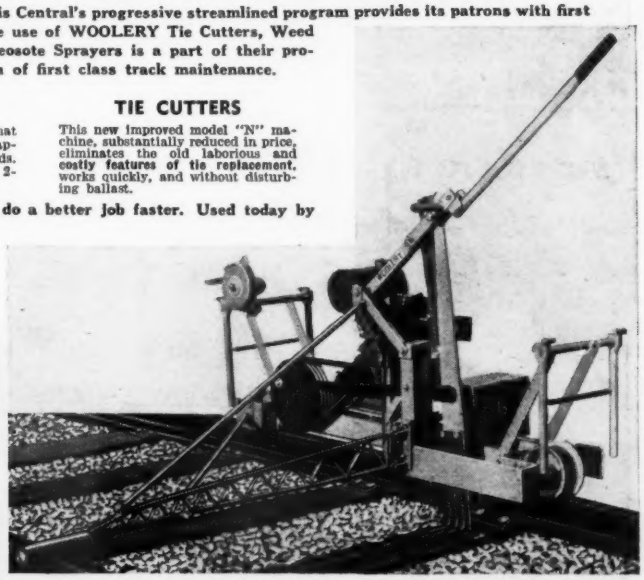
Railroaod cost records show that the use of this machine is the cheapest method of destroying weeds. Available in 5-burner, 3-burner, 2-burner, 1-burner models.

TIE CUTTERS

This new improved model "N" machine, substantially reduced in price, eliminates the old laborious and costly features of tie replacement, works quickly, and without disturbing ballast.

WOOLERY Track Maintenance Units are designed and built to do a better job faster. Used today by more than 75 railroads. Write for complete details.


A SOLID WALL OF FLAME 25 FEET WIDE



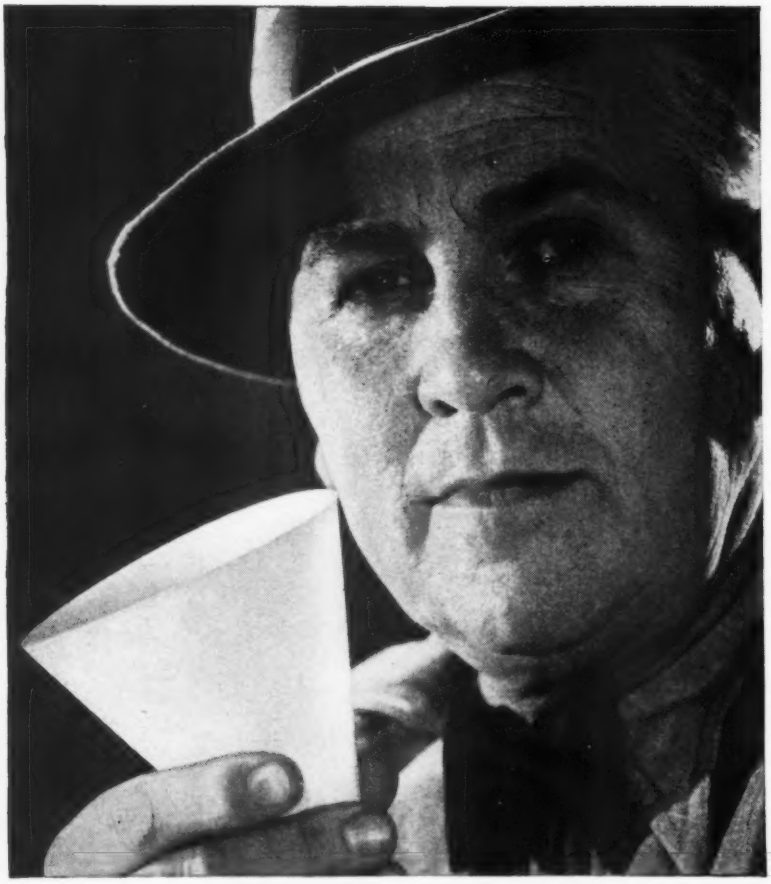
WOOLERY MACHINE COMPANY

MINNEAPOLIS — Pioneer Manufacturers of — MINNESOTA

RAILWAY MAINTENANCE EQUIPMENT

RAILWAY WEED BURNERS • MOTOR CARS • TIE CUTTERS • TIE SCORING MACHINES • RAIL JOINT OILERS • CREOSOTE SPRAYERS • BOLT TIGHTENERS

EXCLUSIVE EXPORT REPRESENTATIVES: PRESSED STEEL CAR COMPANY, INC., PITTSBURGH, PENNA.



"Our labor relations are smoother since we use VORTEX CUPS"

NEW DIXIE PORTABLE WATER CARRIER

Well built for hard use in the field. Insulation keeps 4 gals. cool for hours. Write for descriptive folder. Dixie Cup Company, Easton, Pa.

Take it from 'supers' who have tried it out, there's less grumbling . . . fewer complaints . . . more time saved . . . with Vortex* or Dixie* Cups on the job alongside the men. By placing a cool, *clean* drink within easy reach, you provide an extra health safeguard—besides showing a spirit of cooperation that pays off.

*"Dixie" is a registered trade mark of the Dixie Cup Company

DIXIE CUP

Supply Trade News (Cont'd)

Carl D. Franks, who has been elected vice-president for promotion. Mr. Davis is succeeded by **J. Gardner Martin.**

Frank A. Jones has been appointed chief engineer of the **Dearborn Chemical Company,** with headquarters at Chicago,

Frank A. Jones

to succeed **E. A. Goodnow.** Mr. Goodnow will remain with the company as assistant chief engineer.

Cecil F. Dawson, first vice-president of the **Dixie Cup Company,** Easton, Pa., has been elected president, and **C. L. Van Schaick,** vice-president in charge of sales, has been elected executive vice-president and a director, to succeed the late **Julian E. McGiffert.**

Mr. Dawson was born in Carroll county, Mo., and attended William Jewell col-

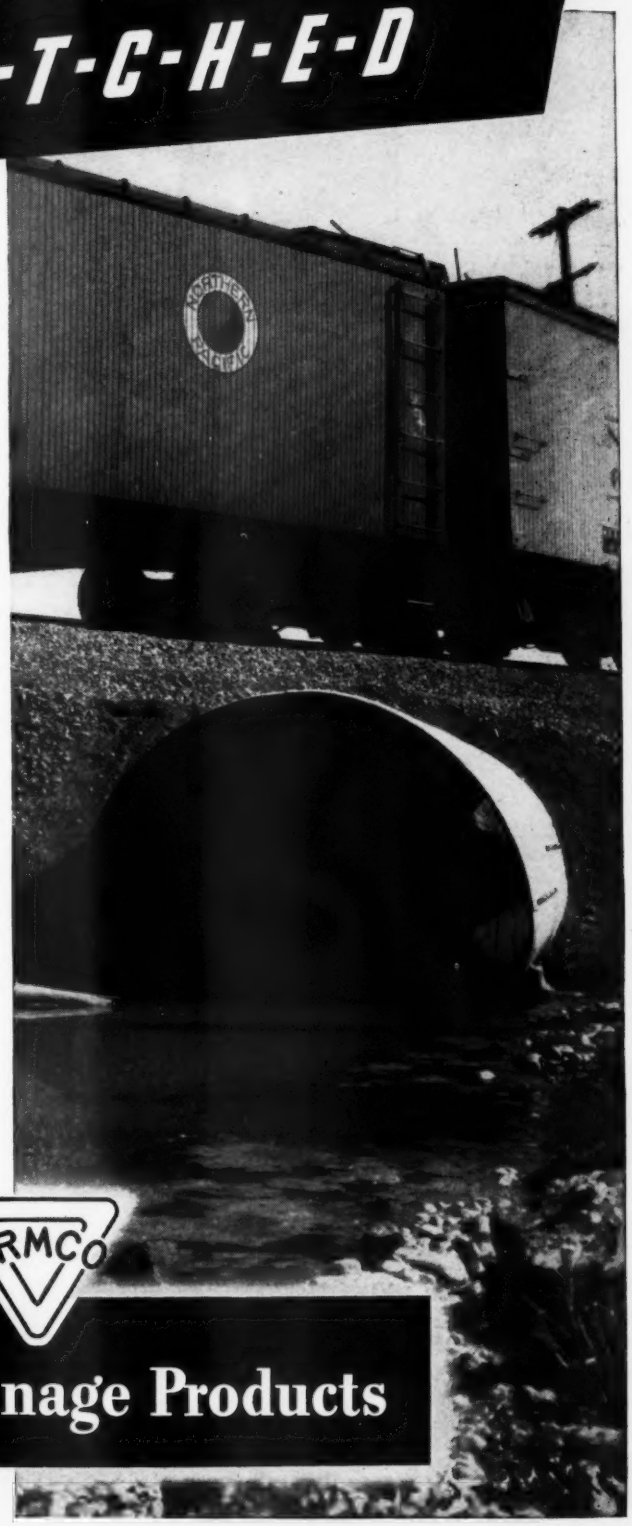
Cecil F. Dawson

lege. He has been connected with Dixie Cup for 32 years, serving in every department of the company except the treasury and accounting departments. Mr. Dawson is chairman of the Executive committee of the board, and is a director.

I. C. Miller, general superintendent of plants of the **T. J. Moss Tie Company,** St. Louis, Mo., has been promoted to vice-president, with headquarters as before at St. Louis. **D. B. Mabry** has been promoted to manager of lumber sales with headquarters at St. Louis. **Ben Zenk,**

(*Continued on page* 438)

Your Drainage Dollar Can Be S-T-R-E-T-C-H-E-D



Costs are high and budgets won't stretch; yet you may be pleasantly surprised to see how far you can make those dollars go with ARMCO Drainage Products. At the same time you can stick to your determination of using the very best materials in the interest of safety and economy.

Many railroad men have found ARMCO Corrugated Metal Products an especially wise choice when faced with the problem of installing culverts and other drainage structures at reasonable cost. This is why:

All ARMCO Corrugated Metal Structures have a high strength to weight ratio. Transportation costs are low. They are easily handled and installed by unskilled workmen. Less time is needed to finish the job. Labor costs are low.

Material costs are low because you choose exactly what you need in a wide range of sizes from 6-inch round pipe to a 24-foot MULTI-PLATE Arch. For severe corrosion there is ASBESTOS-BONDED Pipe, while a PAVED-INVERT will guard against erosion. And either standard corrugated PIPE-ARCH or MULTI-PLATE PIPE-ARCH is just the thing for limited headroom.

These are some of the time-and-money-saving reasons why ARMCO Products help stretch your drainage dollar. Talk over that next problem with the ARMCO Engineer or write us for complete information. Armco Drainage & Metal Products, Inc., 2425 Curtis Street, Middletown, Ohio.

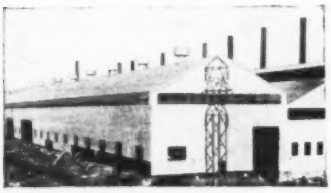
EXPORT: THE ARMCO INTERNATIONAL CORPORATION

ARMCO

Armco Drainage Products

TIME
PROVES
Galvanized (ZINC-COATED) Sheets
Stay Stronger Longer

34 YEARS . . . Erected in 1913, and covered with heavy-gauge galvanized sheets, this Tennessee concentrating plant of the A/Z Company, is still in excellent condition after *more than 3 decades of service.* Painted with Gray Metallic Zinc Paint in 1932.



In building for the future, look to the past for proof of a building material's strength . . . durability . . . service. With galvanized (zinc-coated) roofing and siding, you get the strength of steel . . . the rust protection of Zinc. So for low-cost, long-time service, choose the building material that's proved by TIME itself . . . galvanized sheets. Send coupon for information about Zinc and how it can help keep your buildings and equipment stronger longer.

ZINC INSTITUTE 2 OZ. COATING SEAL OF QUALITY

This "Seal of Quality" is your guide to economy in buying galvanized sheets. It means they carry at least 2 oz. of Zinc per sq. ft.

AMERICAN ZINC INSTITUTE

Room 2831 • 35 E. Wacker Dr. Chicago 1, Ill.

FREE BOOKLETS!

Send me without cost or obligation the illustrated booklets I have checked.

- ☐ Repair Manual on Galvanized Roofing and Siding
- ☐ Facts about Galvanized Sheets
- ☐ Use of Metallic Zinc Paint to Protect Metal Surfaces

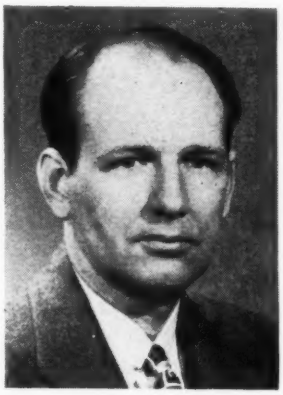
Name_____

Address_____

Town_____ State_____

Supply Trade News (Cont'd)

assistant general superintendent of plants, becomes general superintendent of plants to replace Mr. Miller. **G. C. Eaton,** has been appointed assistant general superintendent of plants, and **Elmo W. Jones,** has been appointed treasurer.



I. C. Miller

Mr. Miller was born on June 11, 1910, at Columbus, Miss., and after a public school education he entered the service of the T. J. Moss Tie Company in 1928. From September, 1928, to 1929 he served as timekeeper at the local plant at Columbus, then under construction. He then served as a clerk from 1929 to 1931; as office manager from 1931 to 1933; as yard foreman from 1933 to 1935; and as plant superintendent from 1935 to 1940. In the latter year Mr. Miller was sent to St. Louis, becoming general superintendent of plants in 1943.

Mr. Mabry was born on June 15, 1909, at Poplar Bluff, Mo., and after a public school education he entered the service of the T. J. Moss Tie Company in September, 1925, as a clerk at St. Louis. From

D. C. Mabry

1933 to 1935 Mr. Mabry spent a training period in production and in the operation of treating plants. He has been engaged in sales work for the T. J. Moss Company during the last 12 years.

(*Continued on page* 440)

FOR TIGHT CORNERS
and
TOUGH SPOTS

Because Burro Cranes are designed and built to meet the specific needs of railroads, they are as efficient and practical on all maintenance-of-way, re-location or track laying as on the countless other odd jobs they do. Short tail swing of the Burro will not foul adjoining track and work can go on regardless of traffic. When Burro is working on single track, fast travel speeds and/or power set-off mechanism will get Burro off the track or to a side track in a hurry.

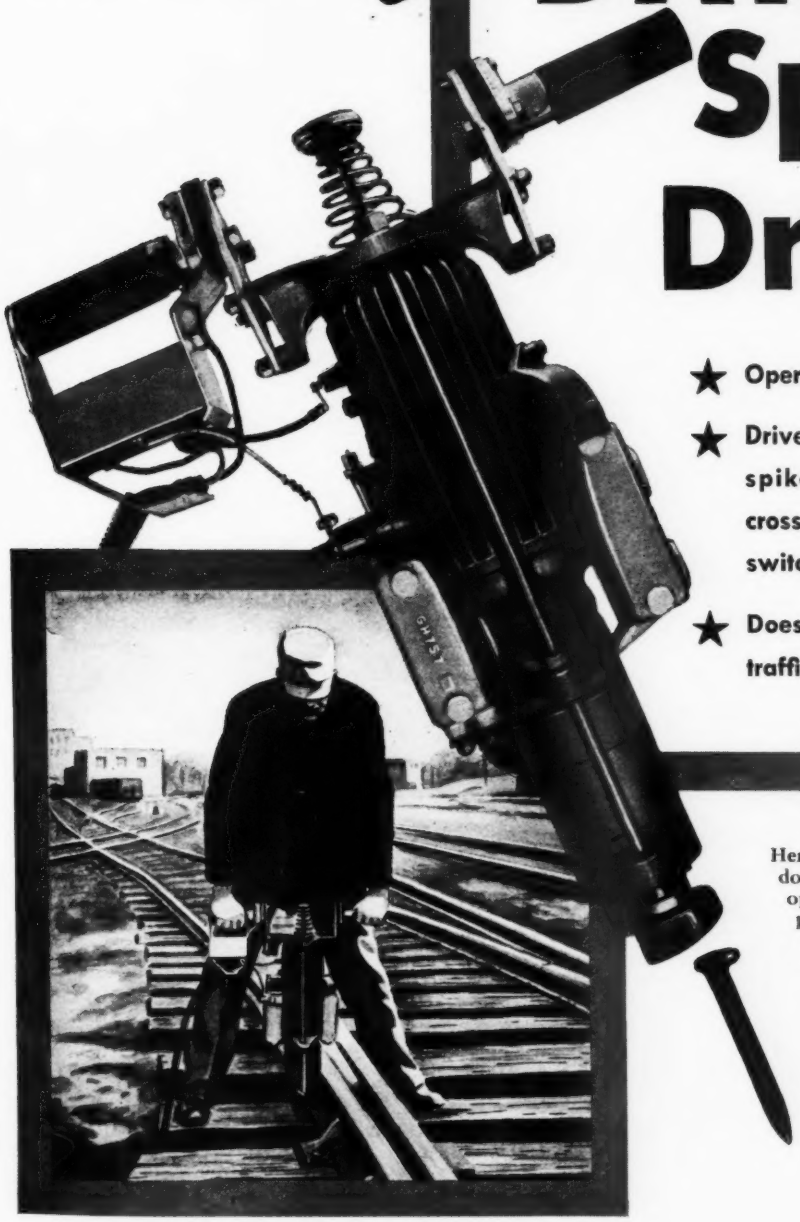
ONLY BURRO HAS ALL THESE FEATURES

- Fast travel speeds—up to 22 m.p.h.
- Draw Bar Pull of 7500 lbs. (often eliminates need for work train or locomotive).
- Elevated Boom Heels for working over high sided gondolas.
- Short tail swing—will not foul adjoining track.
- Low overall height—Burro can be loaded and worked on a standard flat car.

CULLEN-FRIESTEDT CO.,
1301 S. KILBOURN AVE. CHICAGO, ILLINOIS

Introducing

BARCO Spike Driver



- ★ Operated by one man
- ★ Drives anchor spikes and spikes around turnouts, cross-overs and interlocking switches
- ★ Does not interfere with rail traffic

Here's the spike driver that's built to do a faster, better job and cut down operating costs. Light in weight, powerfully yet compactly built, the Barco does not interfere with track operation as is the case with large track equipment. For further information, write Barco Manufacturing Company, 1805 Winnemac Avenue, Chicago 40, Illinois. In Canada: The Holden Co., Ltd., Montreal, Can.

BARCO SPIKE DRIVER

FREE ENTERPRISE—THE CORNERSTONE OF AMERICAN PROSPERITY

Why *play ball* with a

LEAKY ROOF?

Playing catch with roof leaks is always a losing game . . . the score quickly adds up in wasted time as well as damage to your building, freight and equipment.

Avoid the high costs of roof leaks this spring . . . have your maintenance man repair your roof now with **Stonhard Roof Resurfacer.** There's no heating, mixing or expensive equipment required . . . **Stonhard Roof Resurfacer** stops leaks instantly and provides years of protection on any type of roof.

Return the coupon for free roof maintenance guide— No obligation

STONHARD

Building Maintenance Materials

Serving the Railroads Since 1922

811 Terminal Commerce Building
Philadelphia 8, Pa.

STONHARD COMPANY
811 Term. Com. Bldg., Phila. 8, Pa.

Please send us a free roof maintenance guide and information about STONHARD.

Firm .....

Mr. ..... Title .....

Address .....

City ..... Zone ..... State .....

Supply Trade News (Cont'd)

Sherman S. Watkins has opened an office at 102 Front street, Marietta, Ohio, for service as a consultant on timber production, management, sales and wood preservation problems. For 15 years Mr. Watkins was district manager of the Wood Preserving division of the Koppers Company at Marietta.

The Black & Decker Manufacturing Company, Towson, Md., has announced a number of promotions and changes in its outside sales organization. The former sub-branch at Charlotte, N.C., has been established as headquarters for a new territory, comprising the states of North Carolina and South Carolina, and **G. M. Buchanan,** branch manager at Baltimore, Md., has been placed in charge of the new branch. **J. P. Spain,** sales engineer at Chicago, has been promoted to branch manager at Baltimore, to succeed Mr. Buchanan, and **Arthur S. Boehm,** sales engineer at Pittsburgh, Pa., has been appointed branch manager at San Francisco, Cal., replacing **A. W. Helbush,** resigned.

Joseph P. Kleinkort, eastern district sales manager of the **Ramapo Ajax Division** of the **American Brake Shoe Company,** with headquarters at New York, has been appointed general sales manager of the Ramapo Ajax division, with headquarters at Chicago. Mr. Kleinkort is a graduate of St. Louis university, and has served in various sales positions with the American Brake Shoe Company since joining the company in 1923.

Joseph P. Kleinkort

Obituary

James L. Lavallee, manager of the railway traffic and sales department of the Texas Company, New York, died on February 12 at his home in White Plains, N.Y.

Arthur C. Lewis, vice-president in charge of sales of Templeton, Kenly & Co., Chicago, died at Toronto, Ont., on February 23, at the age of 62. A native of Council Bluffs, Iowa, Mr. Lewis first became associated with Templeton, Kenly in 1912, when he went to Canada to open the company's Canadian plant. During World War I he served with the Canadian Army, attaining the rank of major. Following his discharge from military service he became special sales representative for Railway Power & Engineering Corp. at Toronto, returning to Templeton, Kenly & Co. in January, 1944.

Arthur C. Lewis

Trade Publications

(To obtain copies of any of the publications mentioned in this column, use postcards, page 433)

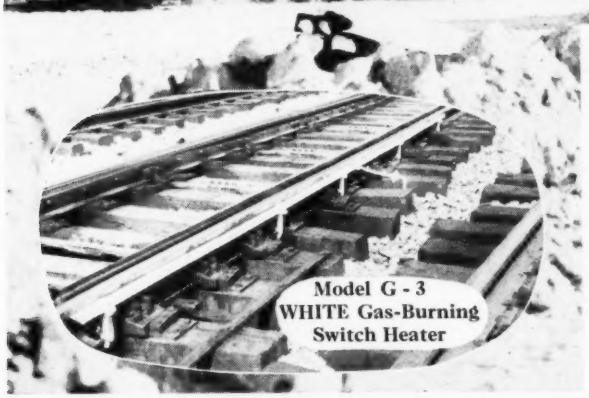
Welding Rods—The Taylor-Wharton Iron & Steel Co. has published a four-page, illustrated bulletin giving the cost of various sizes of the company's manganese nickel steel welding rods. These rods are said to be suitable for repair of railway frogs and switches, as well as other types of manganese steel castings, such as dipper teeth, etc.

Plastic Rock Floors—A four-page maintenance news sheet has been published by United Laboratories, Inc., for railroad personnel interested in the repair and maintenance of platforms and floors. In addition to describing the product and its applications, the pamphlet contains illustrations showing a railroad platform before and after Plastic Rock was applied.

Portable Power Tools—The Mall Tool Company has recently published a 36-page, two-color catalog devoted to its portable power tools for railroad maintenance and construction. Liberally illustrated with on-the-job photographs, the book also contains detailed descriptions and specifications relative to such tools as rail grinders, frog and switch grinders, rail slotters, rail drills, chain saws, etc.

Grinding Wheels—A. P. DeSanno & Son, Inc., has published a 40-page illustrated catalog entitled "Radiac Grinding Wheels." Bound in an attractive four-color cover, the booklet contains detailed grinding wheel information and recommendations for grinding. It lists the manufacturing processes—vitrified, silicate, resinoid, rubber and shellac—and gives the types of abrasives, the grains and the grades usually supplied in each process.

WHITE Switch Heaters
Proved Best in the New York Blizzard

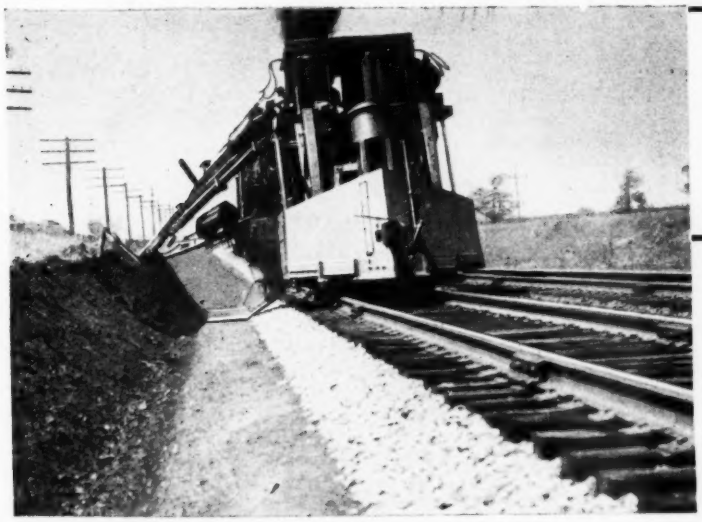


In the recent blizzard around New York City WHITE Gas-Burning Switch Heaters AGAIN proved that they are the only snow melters which can successfully cope with maximum storms. There were no "clogged" switches with WHITE heaters.

Write for descriptive circulars.

White
Manufacturing Company
ELKHART, INDIANA

E. R. Mason, New York; Reade Mfg. Co., Chicago



IT'S TIME FOR THE JORDAN

For Spring maintenance work—reshaping ballast, clearing ditches, re-establishing the good drainage necessary for well conditioned track—there's nothing like the Jordan Spreader-Ditcher.

This "mechanical gang" does many essential jobs better than any other method—and does many more that other methods can't even attempt.

Send for the Jordan Book—contains 100 action photographs of the Jordan at work

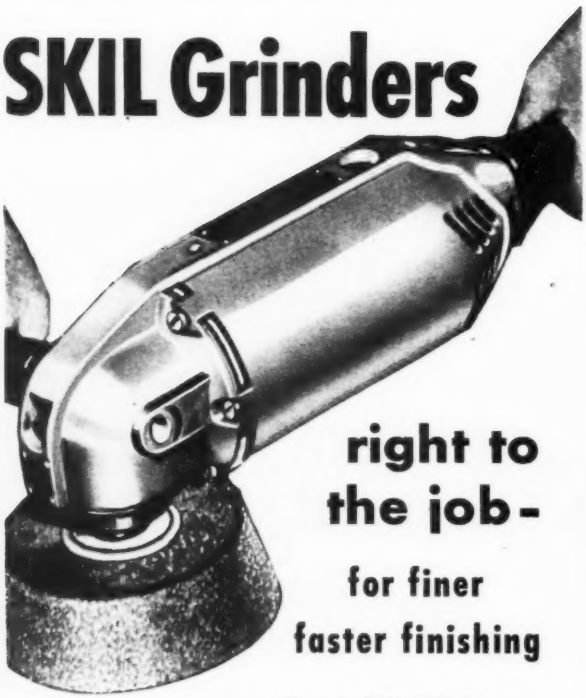
O. F. JORDAN COMPANY

WALTER J. RILEY, *President*

EAST CHICAGO, INDIANA

take these speedy

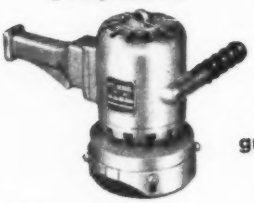
SKIL Grinders



right to the job -

for finer faster finishing

SKIL Sander with cup wheel grinding attachment



Polyphase SKIL Grinder for extra-heavy duty work

Aerial Type SKIL Grinder with 4-inch wheel

Aerial Type SKIL Grinder with 5-inch wheel

SKIL Grinder for 7/8-in. to 2 1/2-in. wheels

SKIL Grinder for 1/8-in. to 7/8 in. wheels

Electric SKIL Grinders are lightweight, easy to carry anywhere . . . balanced right, easy to use everywhere . . . and they pack the punch that assures top grinding speed on thousands of jobs. And for long-run economy you can't beat their high-quality motors, bearings, gears, shafts, housings . . . everything that adds up to lower operating cost per year. See your SKIL Tool Distributor today for a demonstration!

SKILSAW, INC.
5033 Elston Avenue
Chicago 30, Ill.

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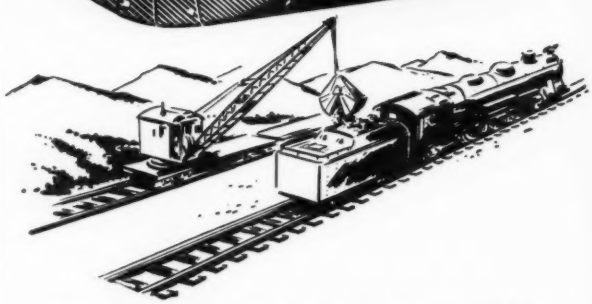

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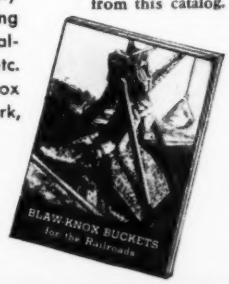

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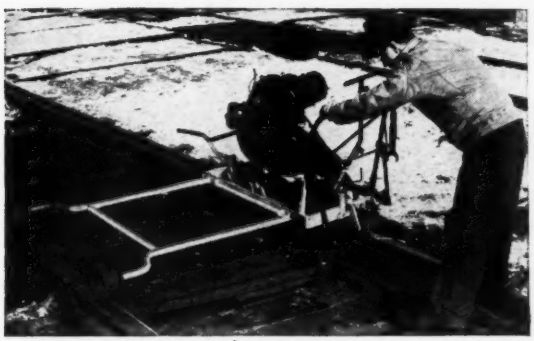

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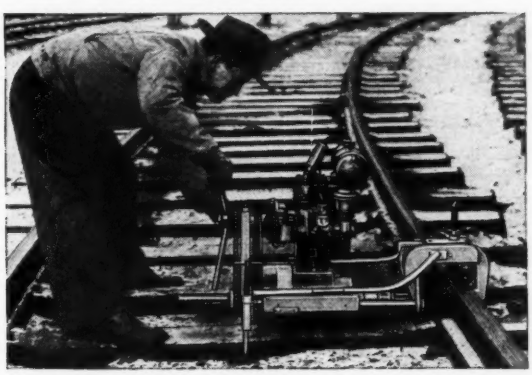

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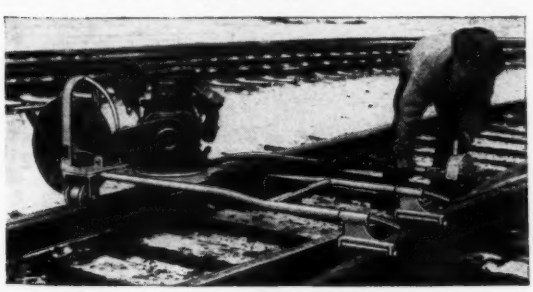

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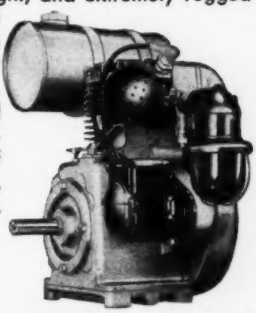

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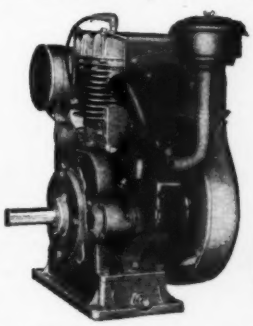

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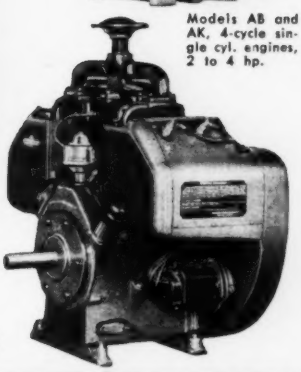

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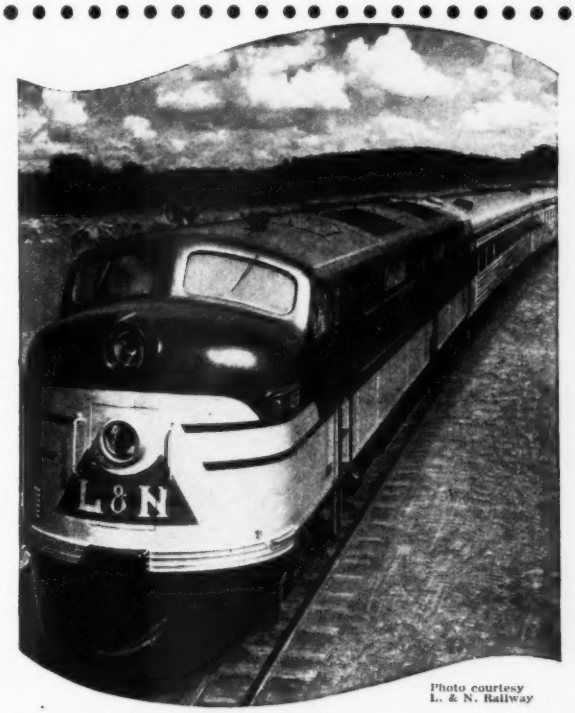

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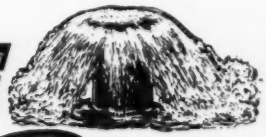

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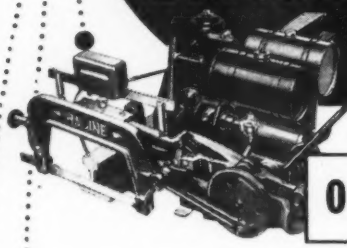

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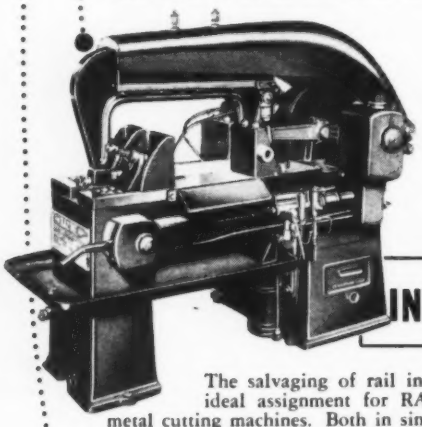

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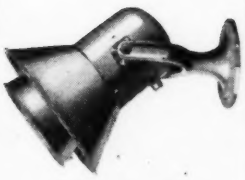

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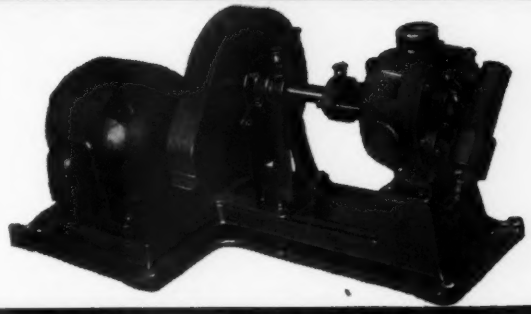

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To be sure of quality, buy aluminum paint made by a reliable manufacturer; and ask whose aluminum pigment it's made with. If it's Reynolds Pigment, that's the very foundation of quality . . . and has been so for a quarter-century.

Because Reynolds works so closely with the paint industry, the chances are that the good brand of aluminum paint you buy will be made with Reynolds Pigment. But it will pay you to check back and make sure. For when it's made with Reynolds Pigment, it's more than paint—it's *Liquid Aluminum.*

Reynolds Metals Co., Pigment Division,
19 East 47th Street, New York 17, N. Y.

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REYNOLDS ALUMINUM PIGMENTS

LIQUID ALUMINUM

Reynolds Pioneering Made Aluminum Competitive—*take advantage of it!*

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GRIP RAIL ANCHORS such as the Improved **FAIR**, grip the rail and positively resist all creeping tendencies